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POPULAR

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Computing WEEKLY

25-31 October 1984

It's the best selling weekly

Vol 3 No 43

128K Machine planned by CBM

COMMODORE is working on a new up-market home micro, intended as a direct competitor for the Sinclair QL.

The machine, called the C128, is based on the 8-bit 6502 processor with 128K Ram and a built-in disc drive.

Unlike the 68008 used in the QL which can address 128K of continuous memory, the 6502 can only address a maximum of 64K at one time. With the C128

Commodore gets around this problem by arranging the 128K in two 64K banks either of which can be switched in as required.

When the C128 is first turned on the machine behaves as an ordinary Commodore 64 and is fully compatible with existing C64 software. Hitting a function key swaps to the other 64K Ram giving access to Basic 3.5, the same version of Basic as that

offered on the new Plus/4 machine, and an 80-column display.

The C128 is likely to be previewed at the January Consumer Electronics Show in Las Vegas.

Also included is Econet software and the word-processor

Acorn's ABC prices

ACORN'S new ABC range of microcomputers, previewed at this year's Personal Computer World Show, will kick-off at £700, rising to £4,000 for the top-of-the-range machine.

For £700 you get the Personal Assistant, technically similar to a BBC machine with a built-in 12 inch black-and-white monitor and single 640K disc drive. Also included is Econet software and the word-processor

continued on page 5 ▶

Frankie steps in

FRANKIE Goes to Hollywood, the top selling pop group with records like *Relax* and *Two Tribes*, are to have a computer program written for them by Ocean Software.

According to Ocean's software development manager the Frankie program is currently at an advanced stage of development: "It will take the form of an arcade-style game featuring members of the band as characters within it," he said.

A spokesman for Frankie

Goes to Hollywood's record company ZTT refused, however, to confirm the existence of the Frankie computer game: "We have nothing to say to your magazine, whatsoever," he said.

Ocean has in the past been involved in a number of joint ventures linking well-known figures to computer games, most notably Daley Thompson for Daley Thompson's *Decathlon*.

continued on page 5 ▶



SPECTRUM+REVIEWED

INSIDE

13 FREE ZX FAIR TICKETS } AMSTRAD DRAW }

AT LAST THE ARCADE ADVENTURE FROM MICRΩMEGA

For The 48K
Spectrum



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stores everywhere.



22 screens of stunning cartoon
animation. Swinging through
the trees collect, drop and use
the objects scattered around.
Speed of reaction is one thing. In
Jasper you must also think fast and
plan accurately.
can you handle it?

The top home computer manufacturers seem to have lost confidence in their ability to continue to innovate, whilst at the same time staying on top of the heap.

Last week Sinclair announced its Spectrum+ to use the wealth of Spectrum software and hopefully get at those people thinking of buying an Electron, Commodore 64 or Atmos. Clever as a marketing ploy but nothing more.

And there is Commodore's C128 which takes bits and bobs from the Commodore 64 and the Plus/4, adds in a disc drive, to get an interesting bundling job.

But it is almost as though both companies are treading water. Sinclair has been at a loss to understand why the QL's microdrives have not been welcomed with open arms and it is taking a long time for UK software houses to come to grips with the 68008. Commodore on the other hand doesn't seem confident that the Plus/4 will 'knock 'em dead'. Commodore UK's manager Howard Stanworth even warned journalists at the Plus/4 launch against prejudging the machine by adverse press reaction in the US.

So both companies are being cautious. Making the most of their respective software strengths and working out what to do next.

With MSX around the corner, launching a 16-bit home micro may be a necessary — but very risky — gamble for Sinclair.

For Commodore, which has yet to offer a 16-bit machine, the dilemma is all the greater.

The problem is that there is no such thing as a good time to launch a machine which is incompatible with your existing base of software.

If he can continue to sort the company out, watch out for something daring next year from Jack Tramiel's new-style Atari.

POPULAR Computing WEEKLY

Vol 3 No 43

>Presents...

News > Your computer show cancelled

Streetlife > Graham Taylor visits the Micro Training Programme

Star Game > Round and round the garden in *Cattapillar* for the BBC B and Electron by Colin James

Machine Review > Sinclair's new *Spectrum+* — plus keyboard, plus software, minus invention?

Giveaway > 250 free tickets to the November ZX Microfair up for grabs to Spectrum and QL owners.

Software Reviews > Eighth Day's *Faerie* > *The Prince* from CCS

Spectrum > New machine-code screen print routine by Stuart Nicholls

Amstrad > Brian and David Lewis bring you on-screen drawing with *Scribble*

BBC and Electron > Twinkle, twinkle little star... I wonder what magnitude you are. Programming on the Electron.

The QL Page > Breath out... here's Part Two of Keith Poole's *Disassembler* program.

Commodore 64 > Some light relief... zap away in *Land of the Giants* by Steve Philips

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>Futures...

Vic20 Star Game > GST's alternative QL operating system > structured listings on the 64 > and Doodle on Spectrum.



Elmer's cat, I'm Gymbalkin, he sent me to help you. Go west to get out of the tower but we ought to find a compass first.

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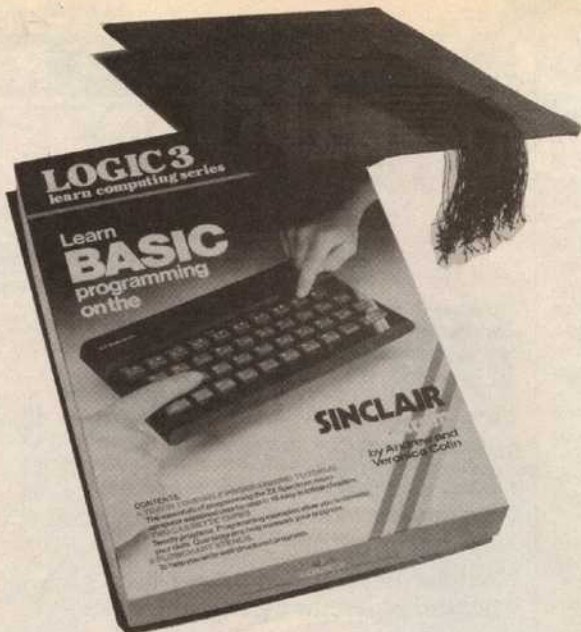
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ABC

56,052 copies sold every week
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Computer Trade Association Magazine of the Year



How to teach your Micro a thing or two

Thousands of home computer owners have yet to discover their microcomputer's potential to help with many of the problems and decisions that come up every day in the home or office.

Perhaps you have always promised yourself that you would teach yourself programming, but have been put off by manuals which seem to assume a lifetime spent studying computer science and mathematics. Maybe you have looked at other computer books, but have yet to find one which is free of unnecessary jargon or where the program examples bear some relevance to real life and not space invaders.

Relax, your search is over.

The 'Learn BASIC' tutorials from Logic 3 are the latest development of a teaching method pioneered by Professor Andrew Colin and perfected

by testing on 3 generations of students at Strathclyde University. The 'Strathclyde Method' has been translated into 8 languages and used by over 300,000 microcomputer users.

'Learn BASIC' is a jargon free, step by step, course in computer programming, which explains everything clearly in English, not computer talk. In a matter of hours you will be writing your first programs.

'Learn BASIC' is designed for people who want to keep abreast of the computer age, for people who realise that understanding computers is a key to future success at work, at school, and as a parent.

Get 'Learn BASIC' and teach your micro how to be useful! (Available from major branches of W.H. Smiths, Boots, Laskys, Greens, John Menzies and better computer shops nationwide.)

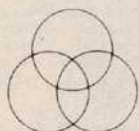


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Dragon games row

A ROW has broken out between Dragon software house Impsoft and Touche Ross, solicitors acting as receiver for the failed micro manufacturer Dragon Data.

Touche Ross is refusing to pay the company any royalties on Impsoft's *Fruity* title originally marketed by Dragon Data and now being sold by Touchmaster.

Touchmaster — the new company formed by former Dragon chiefs Brian Moore and

Richard Wadman after the Dragon collapse — purchased quantities of Dragon Data software from receivers Touche Ross which it is now selling off at a hefty discount.

"Yet we will see no royalty payment from our title because Touche Ross is claiming that the software sold to Touchmaster was 'distressed stock'. Our *Fruity* title which retailed under Dragon Data for £7.95 is now being sold off for £3.95," explained Impsoft's Norman Silver.

"We have instructed our solicitors to clarify our position and we intend to pursue the matter vigorously."

Christmas micro show scrapped

THE YOUR Computer Christmas Computer Fair has been cancelled.

The fair was to have been held at Olympia on November 30-31.

"We felt that the day of the computer show as an end-user's buying extravaganza are over," explained a spokesman for the magazine sponsoring the show, *Your Computer*.

"No doubt it would have been attended by large numbers of people but it probably wouldn't have made money for the software houses attending," he added.

Thirty-eight companies had booked to attend the show when the decision to cancel was made but, of the major microcomputer manufacturers — Sinclair, Commodore, Acorn, Oric, the MSX companies and Amstrad — only the latter had agreed to exhibit.

ABC prices

continued from page 1

and spreadsheet packages *View* and *Viewsheet*. The Personal Assistant is fully expandable to the top of the ABC range.

The £700 tag will make the Personal Assistant attractive to anyone considering assembling a similar system around a BBC machine.

The flagship of the new range — the ABC310 — will sell for £4,000 with a colour monitor and additional 80286 IBM-compatible second processor, 10M hard disc and a selection of bundled software.

Big-name tape deal

A NEW company, Computer Records has released two impressive software compilation tapes

Each of the two tapes — one for the 48K Spectrum and one for the Commodore 64 — contains twelve titles and will retail for £12.99

The two compilation tapes are as follows.

Spectrum: *Hunchback*, *Mr Wimpy* and *Transversion* from

More budget games titles

SOFTWARE Projects — home of Miner Willy — has launched a range of budget-priced software titles under the label Software Super Savers.

Eight titles have so far been announced — all priced at £2.99 — for the Spectrum 48K,



the Commodore 64 and the 8K-expanded Vic20. They are: *Flip Flap*, *Moonlighter*, *Shuttle Shock*, *Ziggurat* and *Fred's Fan Factory* on the Spectrum; *California Gold Rush* and *Faces of Haerne* on the Commodore 64 and *Revenge of the Quadra* on the Vic20.

Software movies now from the US

THE IDEA of linking a computer program to an audio tape, first seen in this country with Automata's *Deus Ex Machina*,



is being developed by a number of companies.

Unlike the Automata pro-

gram, most of the other packages are designed for the educational market where the audio tape contains a spoken commentary on the computer pictures and invites children to answer questions.

American software house Maximus has produced *Software Movies* aimed at the four to eight age range. The packages, for the Commodore 64 consist of program disc and audio tape. After the program is loaded the tape is played and linked to the computer by pressing the space bar.

Speech on the audio track is matched to the lip movement of a cat called Max.

A Kenilworth-based company, Softlee Systems, is using a similar system on its range of Spectrum educational software. Its three programs, *A Day at the Seaside*, *A Picnic in the Park*, and *Jo Visits the Farm*, all teach simple spelling by associating simple spoken words with pictures. Computer and hi-fi or headphones are linked via a simple lead. This system uses the spare channel on the stereo cassette tape to carry the spoken words but requires the child to stop and start the tape between questions. The price for the tapes is £3.75 each with the lead costing £1.95. More details from Softlee Systems, Freeport, Kenilworth, Warwickshire.

The Maximus *Software Movies* are not yet available in this country, but the company can be contacted at 6723 Whittier Avenue, McLean, Virginia 22121, USA.

a number of other countries and you haven't got any market left," commented CRL's Clement Chambers.

"If we could find out who is behind this International Cracking Agency they'd be in the Thames with a set of concrete wellies," he added.

PCS folds

PCS — at one time the largest UK software distributor — folded last week.

The collapse, emphasising the depth of the summer slump in the industry, will not make life easier for many of the troubled software houses. PCS still owes over £60,000 mainly to software companies who will now have little hope of recovering the money.

Pirates get organised

GAMES software houses in the UK now believe that European commercial software pirates are becoming organised.

An International Cracking Agency is now apparently operating, based in Holland, the purpose of which is to circulate recognised software pirates with a 'cracking' disc of software and know-how designed to get round most commercial program protection techniques currently being used.

International organised piracy is now a widespread and serious problem: "It's getting so bad that you can't release a new title slowly through Europe — two weeks after the program is launched in the UK, pirated copies are available in

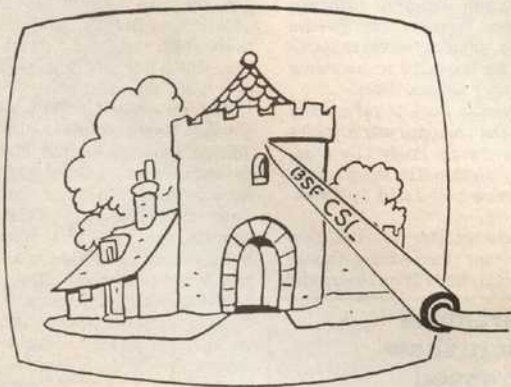
ATTENTION! ATTENTION! ALL COMMODORE USERS

A FREE LIGHTPEN

Yes a FREE Light Pen! with every **GRAPHKIT!** Graphkit is the ultimate in drawing!, designing! or painting! (using the light pen of course, which incidentally has a full 3 year warranty!) Graphkit will amongst other things allow you to:

- Draw free handed on the screen anything from a Micky Mouse to your latest integrated circuit! With all the fill colour and erase facilities of course!
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- Or directly copy the drawing on the screen to the printer! And keep it for ever or send to a friend as a post card!
- Design your own colourful sprites and characters
- Play the games in the package! or use the light pen in your own games/education/programs

GRAPHKIT is available on disk and tape. Tape version is £15.95 and disk version (recommended) is £19.95.



All you 1540/1541 disk users **DMON!** Is here at last. Dmon is the disk monitor you have been waiting for it will allow you to:

- read/write blocks from/to the disk
- display and edit blocks on the screen
- display and send disk messages/commands
- transfer your programs from tape to disk or disk to disk or even disk to tape! • and more!

DMON comes on DISK at only £9.95.

Do you use tapes? Are you sick and tired of waiting for your programs to be Loaded/Saved from/on the tape? Then you need a **TORNADO!!** Tornado allows you to Save/Load/Verify your Basic/machine code programs faster than a CBM 1541 disk drive does! Due to popular demand! Tornado now comes with new and more powerful commands plus extra instructions to assist you in making fast versions of your existing machine code/Basic programs. Tornado is available on tape for CBM 64 and 8K + Vic 20.

Do your Run/Stop and Restore keys often fail? Do you want to come out of those crashes?! Or get into those unbreakable programs?! Then what are you waiting for, get yourself a **BREAKER!!** Reset switch and let your computer know who is the boss!! Breaker can be connected to your machine in seconds, no soldering. Included with the Breaker is a copy of basic recovery software on tape. Now available for any CBM 64 or Vic 20.

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SUSSEX RH10 6JE.**

Amstrad interest

It is good to see in your pages a little more interest in the Amstrad CPC464 — the only machine capable of preventing a love-hate affair between me and a QL.

P J Long's reporting of the Mod function (Letters, October 4 issue) enables a much simplified prime-finding routine:

```
10 CLS
20 FOR n=3 TO 1000 STEP 2
30 FOR m=3 TO SQR(n) STEP 2
40 z = n MOD m
50 IF z=0 THEN GO TO 80
60 NEXT m
70 PRINT n
80 NEXT n
```

The For-To limits in Line 10 can of course be altered to give other ranges, but it should start with an odd number. The program tests for primes at the rate of about 14 odd-numbers per second. It is easily modified to test the various prime-finding formulae which have been proposed from time to time.

And now, back to my dangle-less CP464.

R J Peter
8 Fitzherbert Street
Warsop
nr Mansfield
Notts

Editing system

I was interested to read in one of your September issues of a way of using the QL Quill word processor to write and edit SuperBasic programs using a utility program written by Richard Snowdon.

There is in fact another way of doing this which requires no special utility program, and which uses the Quill Print option to print to a file.

Several things have to be set up before this system works effectively.

The first thing that must be done is for the printer characteristics to be altered by running *mdv1_install.bas* and setting the following parameters:

and puts a preamble on the front of the file which actually gets lost when the SuperBasic program is loaded. If the preamble is not included, you lose the first line of your program.

The second thing is that when editing of an imported SuperBasic test is started, the Design option of Quill should be entered and the following parameters set:

```
Bottom margin      0
Gaps between lines 0
Page size          0
Start page         1
Upper margin       0
```

This ensures that no paging characters are sent to the printer file, and that page delimiters do not appear on screen while editing.

When this is complete, and the text is left-justified (the default condition), a loadable SuperBasic program is generated by *Printing current, whole*, not to printer but to *xxxx.bas* where *xxxx.bas* is the file to be created on *mdv2*. If the file already exists, Quill will ask if you wish to overwrite it.

The SuperBasic program *mdv2_xxxx.bas* can then be loaded and run in the usual way.

I use this system of editing on my PM version QL.

The system is fairly slow, given that Quill takes a long time to load itself, and a long time to Save and Print text, and even longer to import a SuperBasic program. The best procedure seems to be to always edit using Quill and Save the text at the end of each editing session, periodically printing to produce a file that can be loaded and run, and to not edit the file using the ordinary

SuperBasic facilities so as to avoid the need to import the file back into Quill.

Chris Davis
Bristol BS8

Spectrum network

After reading B Cornell's program on the QL page called *Quantum mechanics* in the August 23 issue I wondered why you could not modify this program to utilise the net on the Spectrum and QL, instead of cutting up the RS232 printer cables (even if it was a free gift from Sinclair).

By changing lines 10, 20 and 25 in the Spectrum program to:

```
10 Format "n"; 10
20 Open #6; "n"; 5
25 Let A$ = Inkeys #6
type in as a direct command to the QL—
Net 5
Open #6, Net 0-10
List #6
```

I called the Spectrum network station 10, and the QL network station 5 — the above modifications worked with my JM Rom and produced QL listings on the ZX printer — does anyone know if the Rom type makes any difference to whether the net works?

D C Pitts
7 Station Road
South Cerney
Glos.

Unofficial bug

Perhaps you will be interested in a genuine bug on the Amstrad — not produced by using unusual variable values, or the like — and which I think ought to be publicised because Amsoft have not officially acknowledged it.

I was trying to think of a name for those who take an interest in bugs, and after a moment's thought decided it was safest to say nothing — "buggies" being a bit lame.

The function *Dec\$* does not work in Amstrad Basic although it is listed in their concise basic specification.

If you feel like trying it, type it in a program and you will see that the interpreter recognises

the word and converts it to upper case, but execution will fail with a "Syntax error" report. Extremely unhelpful and time wasting, if you have spent two hours trying to work out what you had done wrong.

It seems this is the reason that the function is not listed in the User Instructions Manual.

You can simulate the function to a certain extent with: *Right\$(Str\$(\langle numeric expression \rangle), \langle sub-string length \rangle)*. But this will not give you the handy formatting features of *Dec\$*, eg, automatically getting a " " in leading empty digit positions.

Finally, in the hope of keeping the software lads on their toes, it would be nice to have software delivered by promised dates. Amsoft's (Tasman written) *Amword* wordprocessor was on 28 day delivery in July. Amsoft have been as helpful as they can be, and said Tasman were going to have it ready to go out by the end of September.

An unoptimistic call to them last week received the reply that it was still not out of Tasman's hands. Perhaps the Spectrum Plus issue will inspire them...

John Mawhood
4 Landford Road
London SW15

Random challenge

I would be interested to hear if anyone has found the same 'bug' which has crashed my game of *Psion Scrabble* for the Spectrum. When using the Quit procedure and requesting to continue the game with the same players all I got was 'B integer out of range, 10, 11'.

I would also be interested to know from which dictionary the vocabulary the game knows was taken. Some of the words appearing are certainly not in any dictionary I can find!

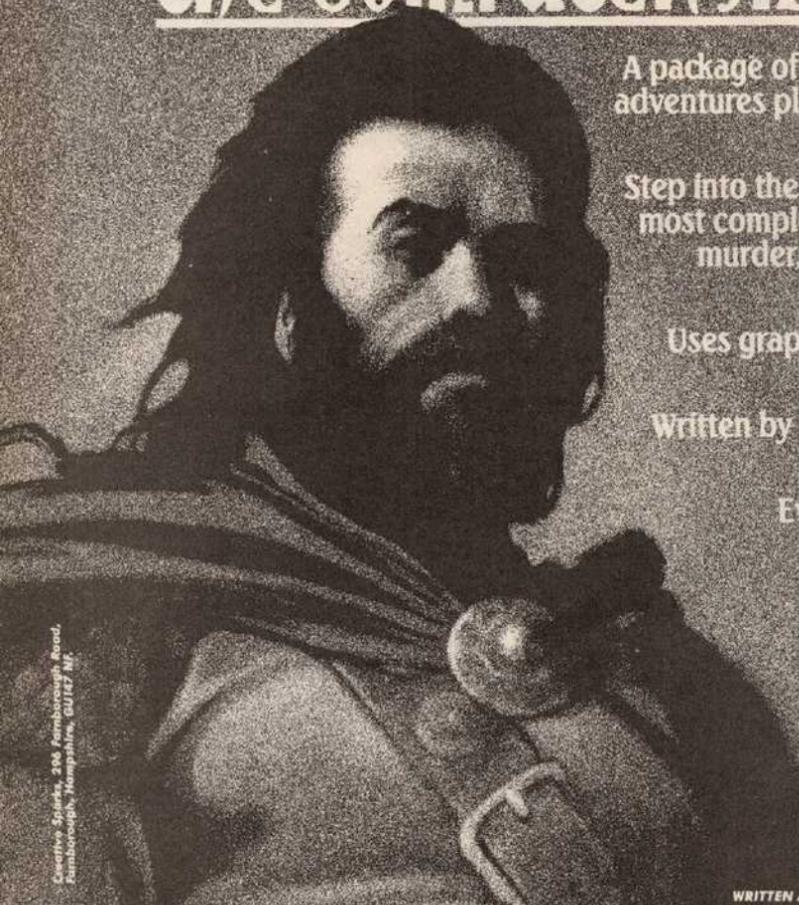
Does the computer challenge at random? The word *Qua* — a valid word — is used by the computer quite often. But, on the four occasions I have used it the computer has challenged it twice.

L T Rees
10 Granville Court
De Beauvoir Estate
Balmes Road
London N1

```
End of line code :<LF>
End of page code :<LF>
Preamble code :!,R.E.M
```

This provides the correct line terminator for SuperBasic,





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AGF products for the ZX Spectrum are compatible with the new Spectrum Plus computer.

A drop in the ocean

Graham Taylor visits the Micro Training Programme which aims to prepare teenagers for jobs in computing

This Christmas thousands of parents will be bludgeoned, harassed, goaded and emotionally blackmailed into paying anything between £100 and £400 on a micro computer. The gist of most devious arguments from astute teenagers will be the claim that somehow a micro computer is going to help at school, with homework and, most tellingly of all, towards getting a job.

Getting a job is difficult. Despite everything ever uttered by everyone about an inevitable momentum towards a technological age, there are still few opportunities for school leavers in computing. Employers, — those prepared to train school leavers can pick and choose from a large number of worthy candidates.

Giving teenagers an edge in the fight for jobs and helping them discover where their computing strengths lie is the Micro Training Programme — a year long course for

reasons; we wanted a networkable system, running Pascal, which could run the kind of software most used in businesses, such as Wordstar and dBase II."

The year's course is divided into various sections, designed to cover the most important areas of computing. There are five week blocks covering software, hardware, business applications, a residential course and an important work experience section using computers in a real company.

I wondered what sort of people had joined the course — were there more men than women? Did they have any existing technical skills — did they already own micros and if so was that an advantage? "Well, the ratio is 70/30 in favour of men and that reflects the original applications. I wish it were 50/50, but short of positive discrimination, which has a lot of problems associated with it, there's little we can do.

"In terms of skills, whilst some had O levels or CSEs, there doesn't seem to be any special link between those kinds of skills and doing well here — girls tend to get used to the computer keyboard quicker since they've often had some sort of typewriter training already.

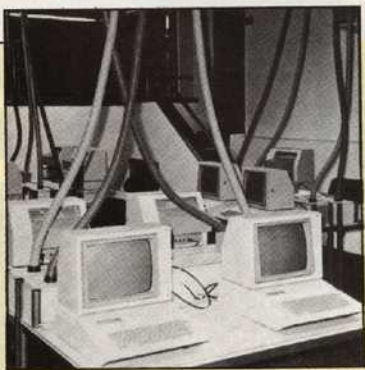
"I think a couple of our students have micros, but, whilst it's obviously not a bad thing, there is a general problem — people learn Basic in a very unstructured way and

think they know quite a lot, but here they really have to start again. Apart from the fact that we teach Pascal as our main computer language, it's more a matter of approach.

So are home micros really relevant at all? "Well, for our purposes no, but then we aren't here to play games — I usually tell people here not to buy them. Apart from anything else, they don't have much money [Standard weekly pay under the Government's Youth Training Scheme under which this falls is £26.25] and they are free to use the equipment here."

The course is not confined to strict computing matters alone; towards its end there is the task of sorting out work placement which will utilise a student's talents and teaching basic skills like letter writing and interview techniques.

This is Dawn Charles' job. "I think a lot of kids come here with unrealistic expecta-



tions about what's possible — you have to help them see that they're not going to jump straight into well-paid jobs in computing.

"What I think we can do at the end of it is produce someone who would make a very well equipped trainee or be suitable for more advanced courses. But of course it's a two sided thing; so far as is possible we try to guide the students towards what they feel they want to do.

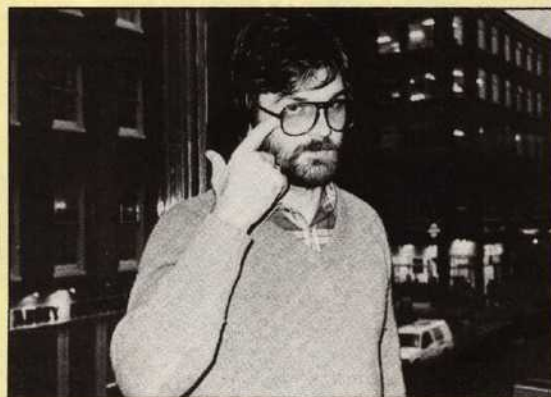
"The work experience section of the course starts in February and all in all I suppose we've been pretty lucky. People like Esso, IBM, the GLC, as well as local firms have all offered jobs at the end of it."

The centre has charity status and is funded by a mixture of donations and various government grants. There are plans to develop it further, by introducing evening courses for 16 and 17 year olds who would receive instruction in basic computing topics and gain hands-on experience with the machines.

There are three further developments planned for the centre; a word processing bureau, a computer consultancy and possibly, but less certainly, a micro-shop. Some of the profits from these operations would go towards the micro-training program, but the hope is that successful entrepreneurs will come in to run the operations, investing their own capital and taking a share of the profits. The entrepreneur would gain certain advantages like access to a lot of useful computer information and a rate-reduced site in Covent Garden. Solvent and proven wiz kids should apply direct.

Said Dawn, "Next year we're hoping to take a slightly higher number of students and get more equipment, but I should stress that we're full up for the time being and, anyway, have to give priority to local young people in the Covent Garden area. What we do need is support from manufacturers, we have some but we always need more."

Manufacturers and other people interested in supporting the Micro Training Programme should contact them at 99-103 Long Acre, Covent Garden, London WC2E 9NR, tel: 01 240 8377. There are no vacancies on the scheme for students at present.



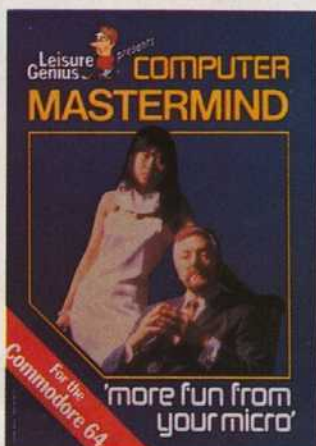
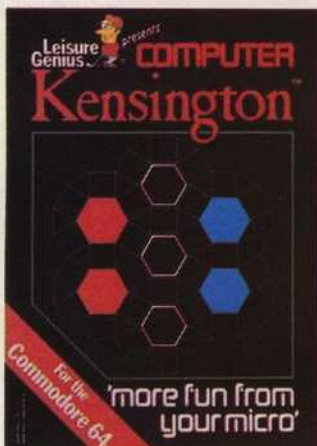
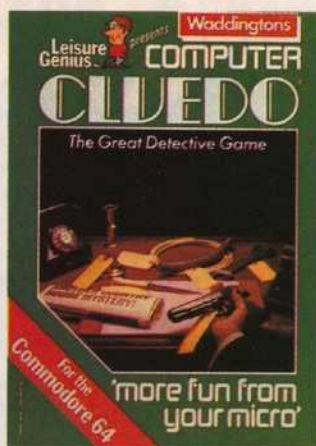
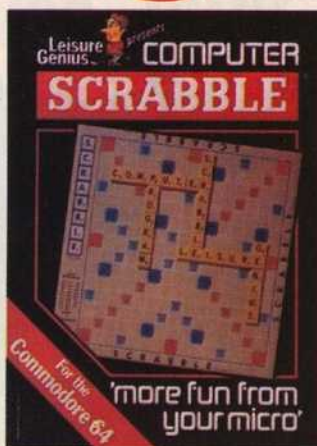
16 and 17 year olds run by the Central London Youth Project. The intention is primarily that the training provided be practical, that students who complete the course should end it with a real chance, not only of getting a job, but of going on to colleges for further training.

I visited the project which is based in Covent Garden and talked to the manager, Steve Jolly about its aims and intentions.

"Although we don't demand any specific qualifications, when we started in June we were clear about one thing — students had to show some sort of motivation towards new technology and we had to be convinced they would last the course."

The centre is equipped with IBMs and Apples rather than BBCs or Spectrums. Why the expensive gear? "When we started there was a deliberate policy decision that we would buy business machines rather than small micros. There are a number of

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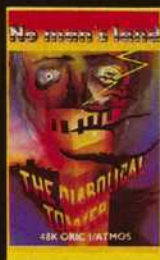
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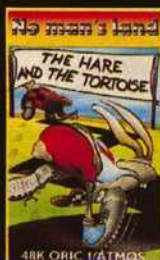
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The Spectrum (+) Connection

Cattapilla

Wander around the garden eating as you go....but watch out for Sammy Snake in Cattapilla for the BBC or Electron by Colin James

The program is in two parts, the first part containing instructions, the second program containing the game *Cattapilla*. It is a version of the old favourite, where as 'Catty Caterpillar', you wander around the garden, eating food, getting longer as you eat, ensuring you don't cross your body and avoid hitting any of the walls.

This is relatively straightforward, until the third and subsequent screens, when you have to avoid Sammy Snake, who will also be wandering around the garden.

Also on view during the game is on-screen scoring, the high score and the name of the person with the high score. A score over 500 can be considered very good.

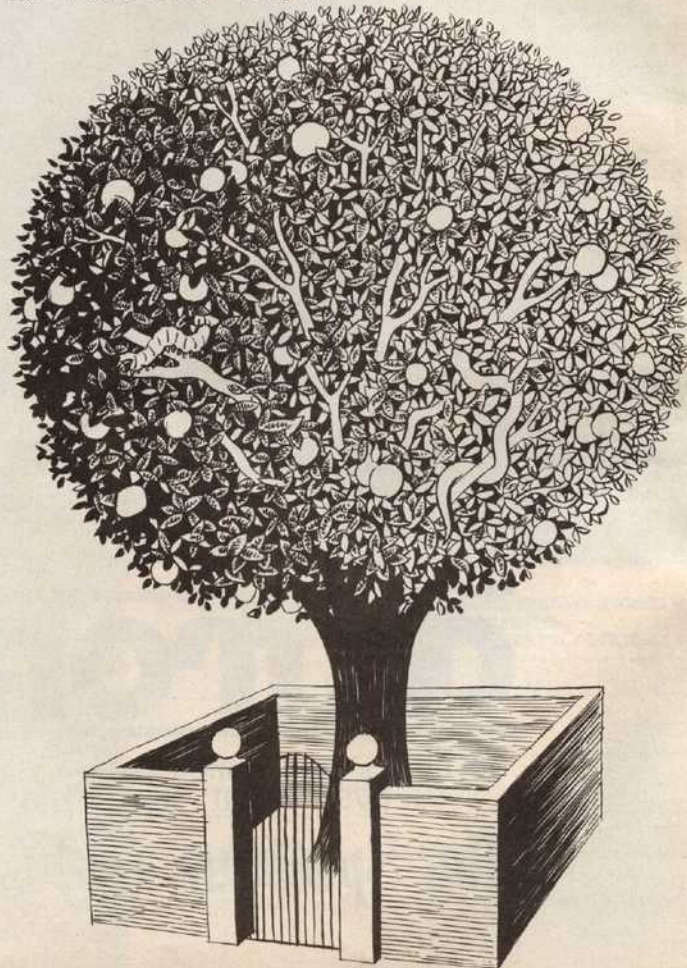
Type in the first program, and save it on tape with *Save "Cattapilla"*. Then type in the main program, and save it on tape after *"Cattapilla"* with *Save "Catty"*. Then load and run the first program with *Chain "Cattapilla"*. The main program should automatically load and run after you have read the instructions.

Program Notes

- 10-20 Program will automatically run if *Break* or *Escape* keys pressed.
- 30 Sets initial colours
- 40 Switch off flashing cursor
- 50 Moves cursor to top right of screen
- 60-260 Instructions
- 300-330 Puts a value into variable (D%) depending on which micro is used
- 340-430 Displays the movement keys, & *Chain's* the main program
- 30-190 Main program loop
- 200-290 *Procwall* — draws the wall and garden, puts up score, high score and high scorer
- 300-430 *Procscreenone* — draws the additional obstacle walls, which appear after the first screen
- 450-480 *Procscreentwo* — draws Sammy Snake at the start of screen three and all subsequent screens
- 490-510 *Procblocker* — moves Sammy Snake
- 520-620 *Procmove* — general movement routine
- 630-690 *Procinitalise-all* — sets the initial variables and conditions at the start of every screen
- 700-750 *Prochead* — draws Catty's head, if there is no obstacle in its path
- 760-810 *Proctail* — moves Catty's tail
- 820-900 *Procfood* — draws the food on the screen.
- 910-960 *Prochit* — if the caterpillar moves on to an obstacle, this routine decides which obstacle has been hit.
- 970-1020 *Prochitwall* — called when Catty hits a wall, to end the game.

- 1030-1080 *Proceatself* — as *Prochitwall*, but called when Catty tries to cross his own path
- 1090-1200 *Procscore* — prints up score at end of a game, if it is a new high score, allows you to enter your name
- 1210-1230 *Procpause* — gives a pause of about three seconds
- 1240-1350 *Procuser-graphics* — sets up the user defined graphics, and line 1330 switches off the cursor
- 1360-1370 *Prochitsnake* — as *Prochitwall*, but called when Catty tries to cross Sammy's path
- 1380-1460 *Procinitalise-once* — sets up ini-

- 1470-1510 tial variables.
 - Procnewscreen* — called at the end of each screen.
 - 1520-1530 Function which returns the colour of a specific point on the screen
- The data statements from Line 1540 onwards should be copied carefully as they contain movements of Sammy Snake.
- Lines 10 and 20 from the first program, and Lines 20 and 30 from the main program may be omitted initially so that the *Escape* and *Break* keys both work as expected.
- Program 1 — Save as "Cattapilla"**
Main Program — Save as "Catty"



```

1000 ERROR RUN
20*KEY10"OLD:MRUN:M"
30MODE2:COLOUR131:COLOUR13:CLS
40VDU23,1,0,0,0,0
50VDU30
60PRINTTAB(2,3)"** CATTAPILLA **"
70COLOUR1
80PRINTTAB(2,7)"Catty Cattapilla"" moves continuously"
90PRINT" around the garden"
100PRINT" looking for food"
110PRINT" However he must"
120PRINT" be careful to avoid:"
130PRINT" his own body and"
140PRINT" the walls."
150PRINTTAB(2,12)"Later on you will"
160PRINT" also have to avoid"
170PRINT" Sammy Snake.He is"
180PRINT" very courteous and"
190PRINT" will wait for you"
200PRINT" to pass if he gets"
210PRINT" stopped by you or"

```

```

220PRINT" the food, but he"
230PRINT" gets upset, and it"
240PRINT" is the end of the"
250PRINT" game if you cross"
260PRINT" his path."
270COLOUR11
280PRINTTAB(2,30)"(Press any key)"TAB(2)"( to continue )":;AS=GETS:
VDU28,0,31,19,5:CLS
290COLOUR1
300PRINT TAB(3,10)"--PRESS--"
310PRINT TAB(2,15)"***:COLOUR11:PRINT"9":COLOUR1:PRINT*** FOR B.B.C."
320PRINT TAB(2,18)"***:COLOUR12:PRINT"E":COLOUR1:PRINT*** FOR Electron"
330key=GETS:IF key<"D" AND key<"E"THEN 330 ELSE D:=ASC(key):CLS
340PRINT:PRINTTAB(5,1)"CONTROLS:-"
350PRINT:PRINT:PRINTTAB(2,1)"A" . . . UP"
360PRINT:PRINTTAB(2,1)"Z" . . . DOWN"
370PRINT:PRINTTAB(2,1)"X" . . . LEFT"
380PRINT:PRINTTAB(2,1)"Y" . . . RIGHT"
410VDU28,0,31,19,21:CLS
420VDU30:COLOUR4:PRINT" START THE TAPE"
430VDU28,0,31,19,22:CHAIN"CATTY"

```

```

10REM***CATTAPILLA***by C.V.James***
2000 ERROR RUN
30*KEY10"OLD:MRUN:M"
40MODE1
50PROCinitialise once
60screen%:=0:sc%:=1:total%:=0:score%:=0:gain%:=35
70PROCinitialise_all
80PROCwall
90PROCfood
100COLOUR2
110REPEAT
120IF screen%>1 THEN PROCblocker
130PROChead:=FX21,5
140IF NTX=0 THEN PROCtail ELSE SOUND1,-15,100,5
150UNTIL CRASH%<1 OR screen%<sc%
160IF CRASH%<1 THEN 70
170PROCscore
180PRINT TAB(8,27)"(any key to play again)"
190END
200DEFPROCwall
210COLOUR2:COLOUR128:CLS:PRINTTAB(4,0)"SCORE = ";
total%:TAB(17,1)"HI-SCORE = ";HS%
220Hilength=LEN** Hi-score by "HLENN%+LEN**":PRINT
TAB(40-Hilength)/2,31)** Hi-score by "HLENN%+LEN**":
230COLOUR0:COLOUR129
240PRINTTAB(0,1):STRING$(20,CHR#224+CHR#225):CHR#227:
STRING$(19,CHR#224+CHR#225):VDU227,226,227
250FOR N=3102761EP2:VDU31,38,N,227,226,227,226,31,38,
N+1,2 . . . 27,226,227:NEXT
260PRINTTAB(12,1):STRING$(19,CHR#224+CHR#225):CHR#226:
STRING$(20,CHR#224+CHR#225):
270VDU28,2,28,37,3:COLOUR131:VDU12,26
280IF screen%>0 THEN PROCscreenone
290ENDPROC
300DEFPROCscreenone
310sc%:=sc%+1
320COLOUR0:COLOUR129
330PRINTTAB(11,7):CHR#227:CHR#229:TAB(29,7):CHR#229:
CHR#227
340PRINTTAB(11,8):CHR#226:CHR#227:TAB(29,8):CHR#227:
CHR#226
350PRINTTAB(11,9):CHR#227:CHR#226:TAB(29,9):CHR#226:
CHR#227
360PRINTTAB(11,10):CHR#226:CHR#227:TAB(29,10):CHR#227:
CHR#226
370PRINTTAB(11,11):VDU227,226,224,225,224,225,224,225,
PRINTTAB(23,11):VDU224,225,224,225,224,225,226,227
380PRINTTAB(11,12):VDU226,224,225,224,225,224,225,
227:PRINTTAB(23,12):VDU229,224,225,224,225,224,225,226
390PRINTTAB(11,21):CHR#229:STRING$(9,CHR#224+CHR#225):
CHR#229
400PRINTTAB(11,22):STRING$(10,CHR#224+CHR#225)
410COLOUR2:COLOUR131
420IF screen%>1 THEN PROCscreentwo
430ENDPROC
440
450DEFPROCscreentwo
460lensa%:=7*screen%:IF lensa%>77 THEN lensa%:=77
470wait%:=wait%-4:GX:=0:HY:=7:IX:=6:JY:=8:PLACE%:=0:TALE%:=
TRUE:FOR initial%:=1 TO lensa%:VDU31,GX,HZ,2

```

```

30:PLACE%=(PLACE%+1)MOD249:PROCmove(GX,HZ,AZ(PLACE%),1)
:NEXT
480ENDPROC
490DEFPROCblocker
500IF FNpoint(10,6X,HZ)<3 THEN ENDPROC ELSE VDU31,GX,HZ,
230:PLACE%=(PLACE%+1)MOD250:PROCmove(GX,
HZ,AZ(PLACE%),1)
510TALE%=(TALE%+1)MOD250:PROCmove(IX,JX,AZ(TALE%),2):
VDU31,IX,JX,32:ENDPROC
520DEFPROCmove(X,Y,XZ,YZ)
530ONZ GO TO 540,550,560,570
540X=X+1:60TO580
550Y=Y+1:60TO580
560X=X-1:60TO580
570Y=Y+1
580ON BZ GO TO 590,600,610,620
590GX=X:HZ=Y:ENDPROC
600IX=X:JY=Y:ENDPROC
610TX=X:TY=Y:ENDPROC
620AX=X:AY=Y:ENDPROC
630DEFPROCinitialise_all
640TX=14:TY=16:AX=11:AY=16:VX=14:VY=16:NTX=0:FOOD
%:=0:head%:=2:tail%:=0:IF gain%<26 THEN gain%:=gain%+15
650IF 0%<66 THEN wait%:=10 ELSE wait%:=4
660MT=1:CRASH%:=0:score%:=score%+gain%
670FORT%:=0 TO 2:cat%(TX)=1:NEXT
680*FX21,0
690ENDPROC
700DEFPROChead
710head%=(head%+1)MOD255:CMX=INKEY(wait%):CMX=(1ANDCMX
+46)+(2ANDCMX+85)+(3ANDCMX+44)+(4ANDCMX+90):IFCMX=0
THENNTX=CMX*FX21,0
720TX=TX+(MX=3)-(MX=1):TY=TY+(MX=2)-(MX=4):cat%
(head%)=MX:IF FNpoint(10,tx,ty)<3 THEN PROCtail
730VDU31,tx,ty,241,31,VX,VY,240:VY=TX:VX=TY
740IF NTX=0 THEN NTX=NTX+1:total%:=total%+1:COLOUR128:
PRINT TAB(12,0):total%:COLOUR131:IF total%<score% THEN
PROCnewscore
750ENDPROC
760DEFPROCtail
770REM *** ERASES TAIL ***
780COLOUR131:VDU31,AX,AY,32
790PROCmove(AX,AY,cat%(tail%),4)
800tail%=(tail%+1)MOD255
810ENDPROC
820DEFPROCfood
830NTX=NTX+FOOD%:SOUND1,-15,100,5
840XF=RD(36)+2:YF=RD(26)+2
850IF FNpoint(10,XF,YF)<3 THEN840
860IF XF=TXANDYF=TY THEN840
870COLOUR0:COLOUR131
880FOOD%:=RD(9):VDU31,XF,YF,228
890COLOUR2
900ENDPROC
910DEFPROCinit
920point=FNpoint(10,tx,ty):IFpoint=0 THEN PROCfood:
ENDPROC
930SOUND1,-15,40:10:SOUND1,-15,27,9
940IFpoint=1 THEN PROCinit:tail%:=0:ENDPROC
950IFpoint=2 AND FNpoint(0,tx,ty)>2 THEN PROCeatself

```

Continued over the page

```

ELSE PROCChitsnake
960ENDPROC
970DEFPROCChitwall
980CRASH%=1:screen%=0
990COLOUR0
1000PRINT TAB(7,16);"YOU CRASHED INTO THE WALL."
1010PROCpause
1020ENDPROC
1030DEFPROCeatself
1040CRASH%=1:screen%=0
1050COLOUR0
1060PRINT TAB(4,16);"YOU TRIED TO CROSS YOUR OWN PATH."
1070PROCpause
1080ENDPROC
1090DEFPROCscore
1100FOR N=1 TO 250:NEXT:CLS:FX21,0
1110COLOUR0
1120PRINT TAB(1,12);"YOU MANAGED TO GROW TO A LENGTH
OF "total%;
1130FOR N=1 TO 100:NEXT
1140IF total%>HSX THEN HSX=total%ELSE 1170
1150PRINT TAB(6,14);"A NEW HIGH SCORE, WELL DONE."
1160PRINT TAB(6,16);"ENTER YOUR NAME: ";:INPUTN$:IF LEN
N$>15 THEN CLS:PRINTTAB(7,22);"name too
long, try again":GOTO1160 ELSE CLS
1170PRINT TAB(12,15);"HIGH SCORE = "HSX
1180length=LENN$** Scored by "LENN$*LEN" **
1190PRINTTAB((40-length)/2,10);"** Scored by
"N$:" **
1200ENDPROC
1210DEFPROCpause
1220TIME=0:REPEAT:UNTILTIME=277
1230ENDPROC
1240 DEFPROCUser_graphics
1250VDU 23,224,255,128,128,128,128,128,128,255
1260VDU23,225,255,1,1,1,1,1,1,255
1270VDU23,226,129,129,129,129,129,129,129,255
1280VDU23,227,255,129,129,129,129,129,129,129
1290VDU23,240,60,126,255,255,255,255,126,60
1300VDU23,241,60,126,90,90,126,126,60,60
1310VDU23,228,74,181,185,189,145,82,84,56
1320VDU23,230,24,102,99,189,189,90,102,24:REM*SNAKE*
1330VDU23,182021:0101
1340VDU23,229,255,129,129,129,129,129,129,255
1350ENDPROC
1360DEFPROCChitsnake
1370CRASH%=1:screen%=0:COLOUR0:PRINTTAB(0,16);" OH
DEAR! -YOU TRIED TO EAT SAMMY SNAKE ":PROCpause:ENDPROC
1380DEFPROCInitialise once
1390PRINTTAB(15,12);"GET READY!":PROCpause
1400INCAT(255):DIMAX(250):FOR F%=0 TO 249:READ AX(F%):
NEXT
1410HSX=100:VDU19,7,2,0,0,0
1420N$="Mickey Mouse"
1430TV255
1440KEY1"MODE6:MVDU17,0,17,129,23,1,1;0;0;0;0:MCLS:MV
DU14:MLISTIM"
1450PROCUser_graphics
1460ENDPROC
1470DEFPROCnewscreen
1480screen%=screen%+1
1490CLS:PRINTTAB(5,12);"Well done, you have scored ";
total%;TAB(5,15);"*it will be harder this time!*"
1500PROCpause
1510ENDPROC
1520DEF FNpoint(R%,S%,T%)
1530=POINT(32*S%+15,(31-T%)*32+R%)
1540DATA2,2,2,1,1,1,1,2,1,1
1550DATA1,1,4,1,1,1,4,4,3,4
1560DATA1,1,1,1,1,1,4,4,4,4
1570DATA4,1,1,1,2,1,1,4,4,4
1580DATA4,1,1,1,1,1,1,1,1,1
1590DATA1,1,4,4,4,3,4,4,4,4
1600DATA3,3,4,4,4,4,4,4,4,4
1610DATA3,3,4,4,4,4,4,4,4,4
1620DATA3,4,4,4,4,4,4,4,4,4
1630DATA2,2,2,3,3,3,4,4,4,4
1640DATA3,3,3,3,3,3,4,4,4,4
1650DATA2,2,2,3,3,3,2,2,1,1,1
1660DATA1,2,1,2,1,1,2,1,1,1
1670DATA1,1,2,1,1,1,2,2,2,2
1680DATA2,1,1,2,2,2,3,3,2,2
1690DATA2,2,2,1,2,1,2,1,1,1
1700DATA4,1,1,2,1,1,1,1,1,1
1710DATA2,2,1,1,1,4,4,4,1,1
1720DATA4,4,4,3,3,3,3,4,4,4
1730DATA4,4,4,3,3,3,3,3,4,4
1740DATA3,4,3,3,3,3,4,4,4,4
1750DATA3,3,4,3,3,3,2,2,2,2
1760DATA2,3,3,3,4,4,4,4,4,4
1770DATA3,3,3,2,2,3,3,3,3,4
1780DATA2,2,2,1,1,2,2,1,1,2

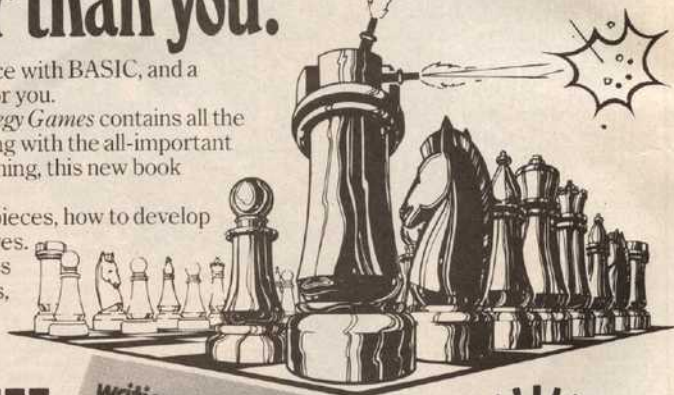
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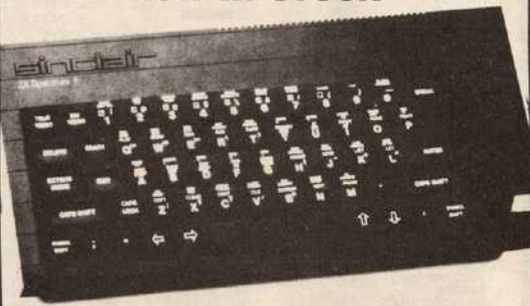
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Machine review

Repackaged

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lis Road, Cambridge.

The major novelty of Sinclair's new computer is that it is available in high street shops now.

But then if that were not the case the whole exercise would have been pointless.

The market for home computers has become notoriously seasonal, with the majority of sales occurring in the weeks before Christmas. The task of the Spectrum+ seems to be to steal sales from the Commodore 64, Acorn Electron, Oric and, perhaps, the Amstrad.

I will be very surprised if it does not succeed. For £179.99 you get a computer that has a reasonable keyboard and whose slightly outdated specification is more than compensated by its huge software base. Six programs, including the excellent word processor package *Tasword Two* and *Scrabble*, are included in the price and, contrary to some press speculation, the Spectrum+ can use all the peripherals designed for the original model.

There are only a few differences between the Spectrum and the Plus, and only one that really matters. The technology used to produce the QL keyboard has been employed to give a "real keyboard" to the Spectrum; 57 keys and a space bar adorn the top of a new, larger casing which measures 12.5 by 6 by 1.5 inches. I still find the Spectrum+ a small machine, but it certainly is more substantial than its predecessor.

To give credibility to my judgement of the keyboard I am writing this review on the machine itself, using *Tasword Two*. I have entered some fairly long programs on the QL's keyboard, and the Spectrum+ has the same 'soft-but-noisy' action. You get used to it, but a few moments spent using something with a 'proper' switch mechanism soon puts



the membrane arrangement into perspective.

It is not just the tactile qualities of the new Spectrum keyboard that have been improved: the extra keys mean that less gymnastics are required to program and write. The old keying sequences will still work, although they are no longer marked. The cursor keys are placed either side of the space bar: there are also pairs of shift keys either side, with caps shift boasting double-sized keytops. The other additions are *Extend*, *Edit*, *Break*, *True Video* and *Inverse video*, *Graphics*, *Caps lock*, and the punctuation marks except colon, delete and break.

These last two are oddly positioned — the break key is where most micros have their delete keys, top right, while Sinclair place the delete key almost where you would find escape or break on other machines, top left.

Interestingly, I tried the new keyboard and case, fitted onto my old Spectrum and there were no problems. Anyone who has attempted to attach a conventional key-

board to their Spectrum may wonder how the double-action keys are wired up without any additional hardware. Normally, using diodes to connect two keys together to be operated by a third will fall foul of the keyboard scanning routine: for reliable operation the shift key must make contact first. On the new keyboard this is achieved mechanically by the membrane under the keys.

Two more improvements are visible on the Spectrum+. A reset button lies under the left-hand edge, a welcome addition but perhaps a little dangerously placed.

Also, the whole computer can be tilted with the aid of two retractable feet under the back of the machine. They position the machine at a comfortable angle, and snap in and out very positively — opening up the case revealed that the springs are actually made of plastic.

Not much else of interest is found inside as the circuit-board is standard Spectrum issue (4B actually).



Obviously, therefore, there will be no problems in running Spectrum software — the one pendant point that I can think of is that some older software may instruct you to use the cursor keys, but actually mean the unshifted keys 5 to 8.

There is a thick metal plate behind the keys, giving a bit more mass to the whole affair, and the extra space and slots mean that the speaker sounds louder, so much louder that it may be irritating to some.

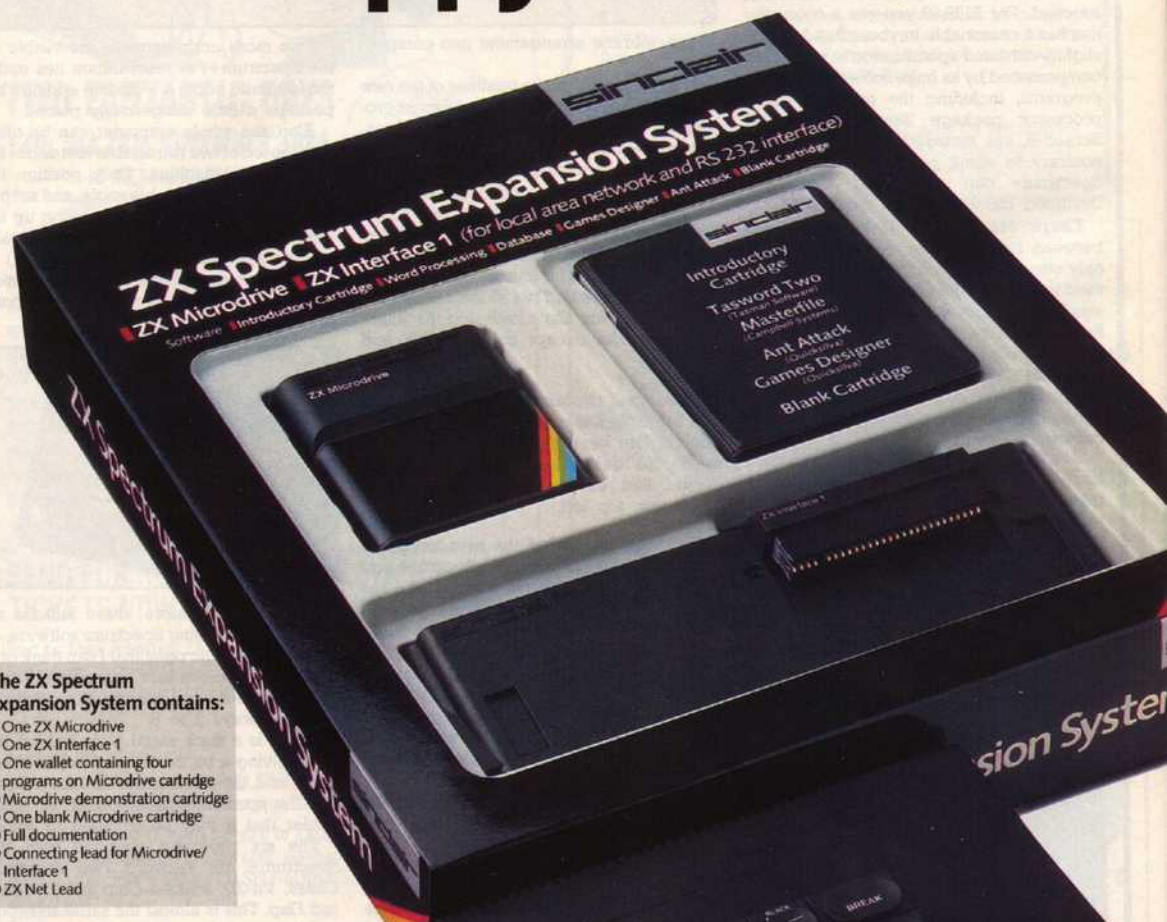
The six programs supplied with the Spectrum+ are *Tasword Two*, *Scrabble*, *Chess*, *Vu-3D*, *Make-a-Chip* and *Chequered Flag*. This is almost the same selection as is currently being bundled with the old Spectrum as a 'six-pack' special offer, except that *Tasword* and *Vu-3D*, replacing *Horace Goes Skiing* and *Survival*, gives the

Continued on page 23



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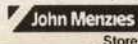
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Machine review

Spectrum+ programs a more serious slant.

Overall impressions are of a stylish and fairly solid computer, still not as substantial as the CBM 64, but in the same class. Unfortunately this image is spoiled if you turn the machine upside down and a number of the key-tops fall off! That could be a little annoying.

The manual that many Spectrum owners have come to know and love has — with the Spectrum+ — been replaced by an altogether more glamorous book. Using colour photographs and illustrations, it deals with the fundamentals in great detail. There are a number of simple routines to show off the graphics and sound and then a reference section for the Basic commands, while the few remaining pages gloss over machine-code and computing in general. This leaves the back cover on which to advertise some Basic programming books from the publishers of the manual.

Information not included in the new manual includes details of system variables, memory formats and the op codes attached to the character set table.

Overall the new manual reminded me of those glossy instructional books about DIY and car servicing: very good up to a point, but a little patronising.

The new welcome tape — a replacement for the Psion *Horizons* tape — falls into much the same category: very hot on the

graphics but somewhat shallow. Side A contains a keyboard trainer with very good screen displays. If you break into the program a remark warns you that it is not an example of structured programming, "it is just meant to work". I broke in to find the bug that, when I had scored 100% on the graphic keys section, told me I needed more practice! The B-side contains only one program, but that contains two enjoyable games and an excellent user-defined character generator, the results of which can be fed into one of the games, *Maze Chase*.

So — the Spectrum+ is more a good example of marketing and repackaging, than a wildly innovative product.

For my money, I would have liked to see either Interface 1 or 2 built in to the new computer, but then it would never have been ready for Christmas.

The current price difference between the Spectrum and the Spectrum+ of £80 only makes sense if you believe that the software currently being bundled with the Spectrum (the six-pack) is a special offer and that the six programs with the Plus is a permanent part of the package.

Nevertheless, the Spectrum+ should bolster Sinclair sales considerably this Christmas and, after eclipsing the old Spectrum model, will probably take its place.

Jeff Naylor



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Popular Computing Weekly is giving away 250 free tickets for the 14th ZX Microfair — to be held at Alexandra Palace on 17-18 November — to the first 250 people who submit programs for the ZX Spectrum or QL for possible publication in the magazine **before November 12.**

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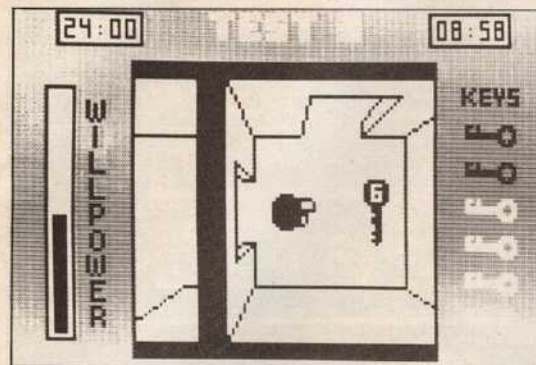
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Touching

Program Backtrack Micro Dragon 32 **Price** £6.95 **Supplier** Incentive Software, 54 London Street, Reading, Berks.

This is a maze game for one, in which the player steers 'Eddie' through the labyrinth. In order to escape, he has to pick up four keys in sequence and then find the exit door before his dwindling willpower is used up.



To assist him there is a map of the maze if he can find it and some items of fruit to revitalise his willpower. To make life difficult, there are snakes in other rooms of the maze which may or may not be lethal and a genetically mutated rug with nasty habits.

Control is by the arrow keys or by any other keys which the

player nominates. The display is very good, being a bird's eye view down into the maze with 3-D perspective. Outside walls have windows which helps orientation except that some mazes have interior walled gardens. The sound of Eddie's running feet as his willpower drains away is quite touching.

This is a game of patience and endurance. The supplier's guide time for the first game is eight minutes and for the fifth is 40 minutes. They either regard the game as insoluble or have

great faith in their sales, for the package includes a competition with a prize of a Cumana disc drive for which the entry qualification is to know what Eddie does after completing Test 5. So far, that prize is nowhere near my grasp.

Derrick Trueman



Gruesome

Program Red Sky over Accrington **Price** £6.95 **Micro** BBC B **Supplier** Vampire Software, P.O. Box MT15, Leeds, LS17 8DW.

Red Sky at night means it went off all right! The game Red Sky Over Accrington begins on 1st July 1985, and over four days the newspaper reports gradually worsen until nuclear war starts.

Red Sky is a kingdom style game where you have to out-guess the computer on the correct proportions of supplies, food, drugs, and access to shelter to get hold of. The scenario is gruesome but the horrible fascination lies in

trying to imagine how values would change in such a situation. What price gold? What price an anti-radiation drug?

You have a choice of actions such as 'move', 'visit casino' and 'buy shelter' but there is only a limited number of these activities before your time runs out. There are simple graphics and a choice of city, mountain, river-bed or grassland landscape, with varying hazards on them including fire, flood, earthquake, infection and mutants.

If you can overcome your horror at the situation, it is a competent strategy game, but its sale is probably limited to those who will enjoy its sensationalism.

Jan Watterson



Outsider

Program Racing League Micro Spectrum **Price** £2.90 **Supplier** Racing League Software, 22 Lindale Garth, Kirkhamgate, Wakefield, W Yorks.

'U'lo, John — want to buy a race horse? Or three of them? Racing League lets you join H Copper, M Thatcher, HM Queen and others in the Sport of Kings.

There have been several racing games for the Spectrum, none of which is a Derby winner, but even in such an uninspired field this maiden should be despatched directly to the knacker's yard!

They're off — Racing League with a 'O OK, 0:1' message. Only a donkey won't Run

without prodding! To be fair, the screens that follow have reasonably clear instructions and error trapping.

But if endless Entering, tables and weighted randomisations were all that the turf had to offer, Brough Scott would be out of a job. Player choices are minimal and, if you should win, the first you will know of it is the result — there are no graphics.

The letter accompanying the review copy speaks of this as the basis for exciting enhancements to come. They should be part of the program now.

Cheap as it is, Racing League is worse value than backing a rank outsider. At least that could give you a moment's excitement for your money.



John Minson

Evil force

Program Heroes of Karn Micro Commodore 64 **Price** £7.00 (cassette) £9.00 (disc) **Supplier** Interceptor, Lindon House, The Green, Tadley, Hants.

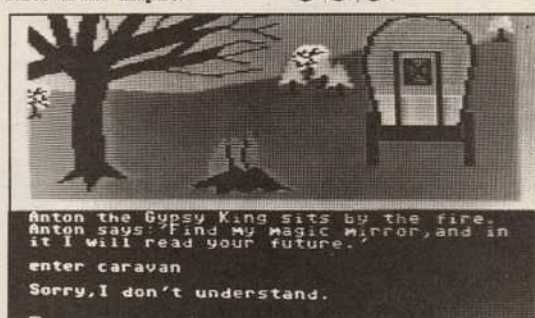
Heroes of Karn is described as a graphical adventure with music.

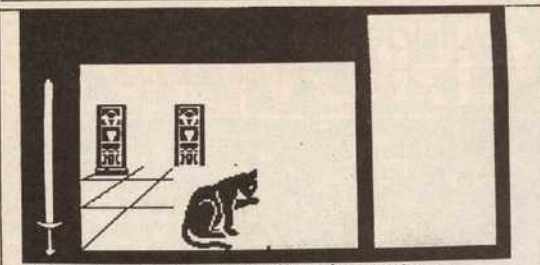
In fact, it is a pretty standard text-based adventure game with hi-res pictures accompanying each scene, with occasional snatches of music at some of the locations. The setting of the adventure is in some indeterminate historical fantasy world in which the Empire of Karn has been overrun by the Powers of the Night, including dragons, vampires, and other obligatory nasties. Only four of the Heroes of Karn have survived, and they have all been taken captive by the evil forces. Your quest is to free them, and recover the treasures of the Empire.

The game is structured in the usual adventure style, with a reasonable number of locations and hazards. The program seems to understand quite a large vocabulary of commands and objects, and even allows you to give instructions to other characters, who will carry them out if they are willing. The graphics provide illustrations of the locations, but they do not enter into the game directly. Although they are quite well done, they are painfully, achingly slow to draw. Fortunately, they only appear on your first visit to each location.

It is a quite challenging adventure, with enough locations and other characters to keep you occupied for some time. It is perhaps best to think of it as a text adventure and regard the graphics as a nice extra feature. But they're so slow.

Richard Corfield





Martin's out. I'm Grymalkin, he sent me to help you.
Go east to get out of the tower but we ought to find a compass first.

Adventure

Program *King Arthur's Quest*
Micro Spectrum **Price** £7.95
Supplier Hill MacGibbons, 92 Fleet St., London EC4.

Here is a very playable, complex and addictive adventure, both challenging the mind and requiring quick reactions at times. There are eight areas to explore during the game, and each has its own perils and opportunities.

The graphics are generally good, and the comments helpful. With the cassette comes an instruction booklet and a wall poster containing relevant history and a code chart. All play is by single key press, except for spells which you type in full. Without giving too much away, I can say that it is worth your while to explore each area fully before moving on, and to write down everything you are told,

no matter how useless or odd.

The game is identical each time you play, so making a map is a very worthwhile activity. It was crash free during testing; though the move commands sometimes seemed a little odd — or perhaps my mappmaking was at fault! There is a "Save" option, enabling you to start from half way through if you are killed off during a game, and I should mention also the facility to back up the game to Micro-drive.

I really enjoyed *King Arthur's Quest*, and I'd recommend it as good value for money for games users who want a new challenge, and more serious users who like a bit of light entertainment from time to time. This program works the mind as well as the fingers, and should be a success in the run-up to Christmas.

Simon Springett



Scrabble

Program *Scrabble* **Price** £12.95 **Micro** BBC B **Supplier** Leisure Genius Retail

I can't help wondering how many PhD theses have been turned into successful computer games. This is one. Peter Turcan created it while researching word structures. The game caused a sensation when released on Sinclair machines a year or so back. Now, despite memory restrictions, it is here on the BBC B.

The game itself is standard *Scrabble* — a board game using letters set out in turn by each player and forming inter-

secting words rather in the manner of crossword puzzles. Various scores apply to each letter and to special positions on the board.

The micro version replaces board and loose tiles with a screen display. The colour of board and tiles can be modified to find the selection which best suits your screen. Up to four players can take part and any of them may be the micro itself.



The cleverest part is the word checking. The micro can check 8,000 words from its own store. If it fails to recognise a word it asks you to verify it. The game plays well and quickly with all the facilities you can enjoy with a board version.

It is quite fun but one has to

ask why — unless you are a compulsive *Scrabble* player isolated on a remote island — you would want to play with your Beeb rather than a fellow human?

Dave Watterson



Jet-BBC

Program *Jet Pac* **Price** £6.95
Micro BBC B **Supplier** Ultimate, Ashby Computers & Graphics, The Green, Ashby-de-la-Zouch, Leicestershire

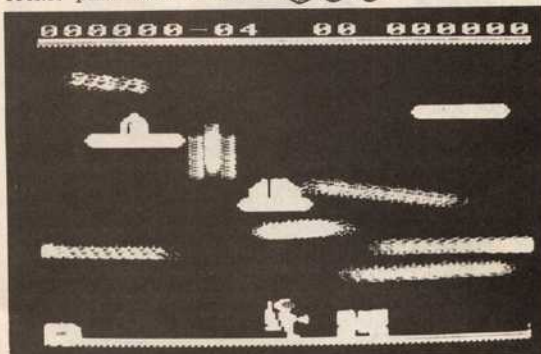
Can you construct a rocket while defending yourself from flying aliens with continuous laser fire? That's the challenge in Ultimate's *Jet Pac*.

You move around with a booster rocket strapped on your back and collect the rocket parts from different

platforms suspended in the air. Once the rocket is complete, you have to fill it up with six packs of fuel and then you can fly to the next planet. The fuel has to be dropped over the top of the rocket, which turns blue as it fills up. Each planet is harder than the previous one. The sound effects are strident and lively, the movement swift and smooth.

It is confusing at first, but once you get the hang of it you move faster and are able to progress.

Dave Watterson



Space Maths

Program *Space Professor* **Micro** Spectrum **Price** £5.95 **Supplier** Front Runner, K-Soft Distribution, 620 Western Avenue, London W3.

Space Invaders get education! Mathematical monstrosities (ie, wrong answers) fall from space towards a sum, with only a laser base and your mental arithmetic to zap them.

Computers are often accused of distracting children from their studies, so a program combining education and alien-blasting should please parents and off-spring alike. But will maths become fun

when the reward is saving the world rather than a gold star?

In its favour *Space Professor* offers a wide range of difficulty (252/84? Quick!). Its menu, using icons, is extremely clear.

But chrome is mere flash when the game below is dull. Work out the solution, shoot the wrong answers and let the right one land.

There is also not enough time to read the problems before the aliens appear, making *Space Professor* too difficult for the youngsters who may benefit from it.

Sadly the ultimate incentive is not to practise maths but to *Load* a game with more variety.

John Minson



Hilarious

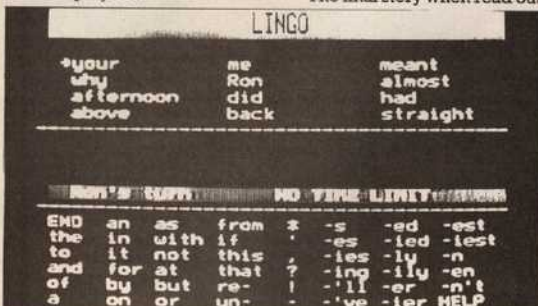
Program *Lingo* **Price** £9.95
Micro BBC B **Supplier**
Complete Microcomputer Ser-
vices Ltd., 32-38 Osnaburgh
Street, London NW1 3ND.

This program, based on an idea by Alan Wakeman, is intended to teach sentence construction. It is built into a fun game which can be played on your own or with up to four players.

'with'.

The game is easy to use, well explained and with simple controls. Your score takes into account how many of the 12 words you use (with a bonus if you involve them all) and how many of the pool words you use. The micro has to take your word for it that the sentence is correctly constructed so its value as an unsupervised educational aid is very limited. You may set a time-limit if you choose.

The final story when read out



The program has 700 words and it chooses 12 at random which you then have to construct into a sentence with the help of a pool of common words and terminations: the cement that binds words into sentences like 'the', 'ly' and

may be grammatically correct but its absurdity is usually hilarious. That's what makes *Lingo* fun to play.

Jan Watterson



Slow

Program *Supabasic Micro*
Commodore 64 Price £9.99
(cassette or disc) **Supplier** Inter-
ceptor, Lindon House, The
Green, Tadley, Hants.

Commodore's decision to equip the 64 with a rather primitive version of Basic has led to the appearance of a large number of Basic extension programs.

One of the latest is *Supabasic* from Interceptor. This gives you a further 72 Basic keywords covering the usual range of additional commands for graphics, sound, sprites and programming aids.

Unfortunately, no structured Basic keywords are included.

Although the new commands do include a number of handy additions there are a number of notable omissions. For example, there are various commands for manipulating a hi-res display including

some nice features like a *Window* command to display a text window at the bottom of the hi-res screen. However, only standard hi-res mode can be used, not multi-colour, and a number of other popular commands like *Circle* and *Fill* are missing.

Similarly, programming aids like *Old* and *Remember* are provided, but no *Auto* and *Delete* which are at least as useful. On the other hand, the facilities provided for the handling of sprites and user-defined characters are quite complete and easy to use.

The biggest drawback of *Supabasic* is its execution speed, or rather lack of it. Although many commands execute at roughly normal speed, both numeric and string expressions are evaluated at a snail's pace — two to three times more slowly than the standard Basic.

John Minson

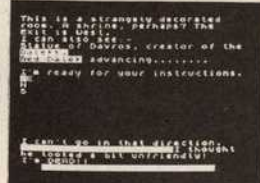


Time Lord

Program *The Key to Time*
Micro Spectrum **Price** £5.95
Supplier Lumpsoft, 17 Har-
drow Road, Leeds

This is an adventure game based on the travels of a certain Time Lord, well known for travelling about in a police box. It is a text only adventure, but none the worse for that.

The Doctor has been placed under your command, and your task is to help him to find the five parts of the Key, thus, as usual, saving the universe. The game recognises a wide vocabulary fairly well — with the exception of the phrase "go to" which usually got the reply "I can't tie a rope to that!" There are numerous more or less



useful objects to find, retrieve and use.

This game is a good one. It promises all sorts of adventures for the budding Time Traveller, and many hours of enjoyment. There is no "Save" option — the length of the game makes this a sad omission — and no microdrive option either. These are minor problems in a well designed game, and it should do well.

Simon Springett



Bearface

Program *Castle of Gems* **Price**
£5.70 **Micro** BBC B **Supplier**
MRM Software, 17 Cross
Coates Road, Grimsby.

Bertie Bear has to eat all the gems on each screen before his rivals do. The opposing characters include spring-like Gem Gobblers, Gremlins, deadly Moving Trees, Ghosts and Witches. If he puts on the hat he becomes invisible and invincible he can kill witches and walk through his competitors.

The castle setting is like something from Escher — endless staircases with occasional lifts so that moving around can be confusing at first. When all

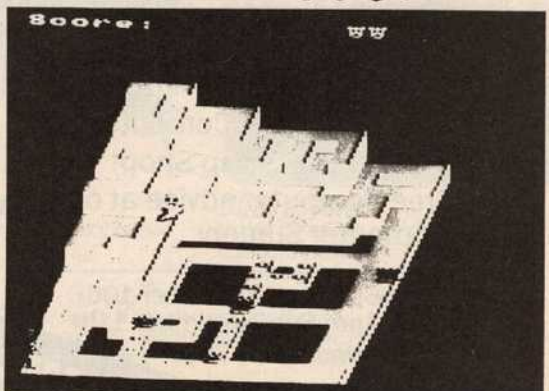
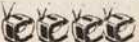
gems have gone from one screen Bertie can progress on to the next.

There are nine on each side of the tape — each harder than the last. Some are faster, some have more enemies, some have more complicated stairs and paths for Bertie to follow. Honey-pots appear on some screens and give bonus points.

The controls are left, right, up and down, which you can operate from keyboard or joysticks.

It is great fun to play being fast, furious and colourful. It has good sound effects and music, is easy to pick up and compulsive to play. If you can't get to an arcade to play *Crystal Castles*, it's a good second.

T&H Alabaster



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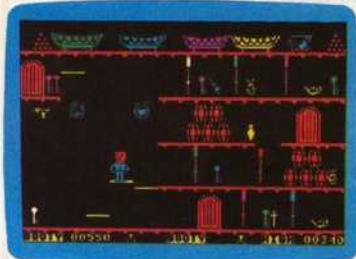
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GWK

Bigger and bigger

Make your screen just a bit bigger using this m/c program by Stuart Nicholls, for the 48K Spectrum

Spectrum owners, would you like to be able to enter the following types of line into your BASIC program:

```
10 REM SET UP SCREEN (24 lines)
20 border 4:PAPER 2:INK 7:PRINT CHR$ 12;
30 PRINT AT 23,0; "THIS LINE STARTS ON THE
  ACTUAL BOTTOM LINE OF THE SCREEN...
  WOT NO ERROR REPORT?"
40 REM SCROLL THE SCREEN .. TWICE
50 PRINT CHR$ 11; CHR$ 11;
```

What's this? Printing on the *Edit* lines without the usual *Print #0;* at 0,0; "message", clearing all 24 lines and a scroll call *Print Chr\$11;* with no sign of a machine code routine *Usr* call. Well, the answer is yes it is possible and what is more it is not interrupt driven, does not require the microdrive 'shadow Rom' and works on a standard 48K Spectrum. (I assume it will work with microdrives attached but have not been able to prove this).

Although the answer is of course a machine code routine, we do not need to call it in anyway, as the Spectrum can be made to do this for us using a simple Basic command.

The Spectrum Rom machine code routine to *Print* a character makes use of an all-purpose subroutine accessed in machine code using the well known *Rst 16d* instruction. This subroutine normally occupies Rom area 09F4h to 0EA3h and handles printout to the *Upper* screen, *Lower* screen and the *Printer* so is slow in comparison to a dedicated *Upper* screen *Print* routine.

The word 'normally' in the above statement gives a clue to the answer. The Rom *Print* subroutine is accessed by the Rom using data in Ram! That is, whenever printing to the *Upper* screen is required *Stream 2* is selected and the address of the *Print Output* routine to be used is taken from the *Channel 'S'* data in Ram. The base

address of the channel data is pointed to by the system variable *Chans 23631/2* and is normally situated after the system variables occupying the 21 bytes before the Basic program area (the fitting of a microdrive will alter this).

The *Channel 'S'* information normally occupies addresses 23739-23743 and is in the form:

```
23739/40 Address of Output routine 09F4
23741/42 Address of Input routine 15C4
23743 53h Chr Code "S"
```

So you can see that we are able to alter the output routine address to point to a user written routine, and that is exactly what has been done.

I have produced a revised *Print* routine with games programmers in mind, although it has its uses for more serious applications, and gives other functions.

Because Keywords and the Spectrum graphics characters are seldom used in actual programs, and I wanted the new routine as short as possible to speed things up, these are ignored. For a similar reason *Inverse* has been left out. Characters 32 to 127 and *Udg's* are printed, as are colour, *AT*, *TAB*, and *N/L* controls. (You are still able to use your own character generator in Ram if you wish in the normal way).

Printing is allowed on all 24 lines. For example *Print Ink 0; Paper 5; Over 1; At 23,0;* "A" is quite acceptable and will print on the bottom line.

If the line or column number exceeds the screen size then the routine will amend it to stay on the screen, providing it does not exceed 255. For example, *Print At 24,32;* "A" is the same as *Print At 0,0;* "A". This can give the effect of a wrap around screen.

If printing runs off the bottom of the screen then the screen will automatically scroll and does not give the usual 'scroll?' prompt.

Because the Basic *Cls* will only clear 22 lines (0-21) I have included a *Clear 24* lines code (also *Cls* will re-instate the Spectrum Rom routine). *Print Chr\$ 12;* will clear the screen using the permanent colours and set the print position to 0,0; A semicolon must be used to suppress the newline code that would be printed if we used *Print Chr\$ 12.*

Print Chr\$ 11; will produce an *Upscroll* but leave the print position unchanged. Note again that the semicolon has been used. *Print Chr\$ 11* will produce an *Upscroll* with a *Newline*.

Print Tab column; is also permitted, and has the advantage over the Spectrum routine of not removing printing between the current print position and the *Tab* position.

The interrupts are disabled whilst printing and scrolling.

Using your favourite *Hexloader* enter the code from the *Hexdump*. The checksum byte at the end of each line is the sum of the previous 8 bytes. The start address is 64500 and the routine is 465 bytes long.

Once entered then Save the code using Save "name" Code 64500,465. To switch routines you should enter a line into your Basic program before any *Print* commands as follows.

Without microdrive fitted use 10 0,251. With microdrives fitted (but note that the routine has not been proved this way) use:

```
10 Let Chans=Peek 23631+256*Peek 23632
20 Poke Chans+5,244:Poke Chans+6,251
```

This *Pokes* a new value into the output routine for channel 'S'. This new routine will now remain in operation until a *Cls* command is used or the Spectrum produces an automatic listing. This in no way affects the use of the printer and error reports or *Input* commands will overprint on the *Edit* lines using *Bordercolours*.

Using all this information, you will see that it becomes very easy to move characters over all the screen and so improve your games programs. I have included my Assembly listing (using the *Picturesque* assembler) should you wish to try out your ideas.

```
0001: *****
0002: **
0003: ** NEW PRINT ROUTINE **
0004: ** by
0005: ** Stuart Nicholls **
0006: **
0007: *****
0008:
0009: *SCREEN FORMAT*
0010: *TOP LH-Line 24/Col.33*
0011: *BOT RH-Line 1/Col. 2*
0012: *B register holds Line*
0013: *C register holds Col.*
0014: *HL holds SCREEN ADDR.*
0015:
0016:
0017:
0018:
0019:
0020: TVDTA EQU 23564
0021: CURCH EQU 23633
0022: TEMPS EQU 2211h
0023: EPOSN EQU 23680
0024: DFCC EQU 23684
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FC0A 19	0220	ADD HL, DE		FCCB C5	1150	PUSH BC	
FC0B E5	0230	PUSH		LD BC, (UDG)	1160	JR CHAR1	
FC0C C3B7FC	0240	JP FPOSN		FCDD 10B5	1170		
	0245			FCDD C5	1180	PUSH BC	
FC0F 42	0250	DEFB 66		FCDD E4B365C	1200	LD BC, (CHARS)	
FC10 41	0260	DEFB 67			1205		
FC11 40	0270	DEFB 64		FCDD E8	1210	CHAR1 EX	DE, HL
FC12 3F	0280	DEFB 63		FCDD 2600	1220	CHAR2 LD	H, B
FC13 3E	0290	C10	DEFB 62	FCDA 4F	1230	LD	L, A
FC14 3D	0300	C11	DEFB 56	FCDE 29	1240	ADD HL, HL	
FC15 0C	0310	C12	DEFB 12	FCDD 29	1250	ADD HL, HL	
FC16 2D	0320	C13	DEFB 45	FCDD 29	1260	ADD HL, HL	
FC17 3A	0330	C14	DEFB 50	FCDE 09	1270	ADD HL, BC	
FC18 39	0340	C15	DEFB 57	FCDF C1	1280	POP BC	
FC19 46	0350	C16	DEFB 70	FCDE E8	1290	EX DE, HL	
FC1A 45	0360	C17	DEFB 69	FCF1 79	1300	LD A, C	
FC1B 44	0370	C18	DEFB 68	FCF2 3D	1310	DEC A	
FC1C 43	0380	C19	DEFB 67	FCF3 3E21	1320	LD A, 33	
FC1D 42	0390	C20	DEFB 66	FCF5 2002	1330	JR NZ, ALL1	
FC1E 41	0400	C21	DEFB 65	FCF7 05	1340	DEC B	
FC1F 3B	0410	C22	DEFB 59	FCF8 4F	1350	LD C, A	
FC20 3A	0415	C23	DEFB 58	FCF9 09	1360	CP	
	0416			FCFA D5	1370	PUSH DE	
FC21 F3	0420	CLS	DI	FCFB CC76FD	1380	CALL Z, SCRL	
FC22 210940	0421	LD HL, 16304		FCFE D1	1390	POP DE	
FC23 18140	0422	LD DE, 16305		FCFF C5	1400	PUSH BC	
FC2B 01FF17	0423	LD C, 163		FCFA E5	1410	PUSH HL	
FC2B 3600	0424	LD (HL), 0			1465		
FC2D EDB0	0425	LDIR		FCF1 3A915C	1466		"Consider OVER"
FC2F 23	0426	INC HL		FCFA 06FF	1470	LD A, (PFLAG)	
FC30 13	0427	INC DE		FCF2 1F	1480	RRA	
FC31 01FF02	0428	LD BC, 767		FCF7 3001	1490	JR C, ALL2	
FC34 3A0D5C	0429	LD A, (ATTRP)		FCF9 04	1500	INC B	
FC37 27	0430	LD (HL), A		FCFA 0E08	1510	LD C, B	
FC38 EDB0	0431	LDIR		FCFB 47	1520	AND	
FC3A 012110	0432	LD BC, 021H		FCFB EB	1530	EX DE, HL	
FC3D 210940	0433	LD HL, 16304		FCFE 1A	1540	LD A, (DE)	
FC40 C354FD	0434	JP SETCL		FCFF A0	1550	AND B	
	0435			FCFA AE	1560	XOR (HL)	
FC43 0E21	0436	NEWMN LD C, 33		FD01 12	1570	LD (DE), A	
FC45 CD76FD	0437	CALL SCRL		FD02 14	1580	INC D	
FC48 05	0438	DEC B		FD03 23	1590	INC HL	
FC49 C354FD	0439	JP SETCL		FD04 0D	1600	DEC C	
	0440			FD05 20F7	1610	JR NZ, ALL3	
FC4C F3	0441	UPSCR DI		FD07 EB	1620	EX DE, HL	
FC4D CD76FD	0442	CALL SCR		FD08 25	1630	H	
FC50 FB	0443	ET		FD09 CD11FD	1640	CALL ATTR	
FC51 C9	0444	NOPNT RET		FD0C E1	1650	POP HL	
	0445			FD0D C1	1660	POP BC	
FC52 116FCF	0446	TV2 LD DE, CONT		FD0E 0D	1670	DEC C	
FC53 320F5C	0447	LD (TVDTA+1), A		FD0F 23	1680	INC HL	
FC58 100B	0448	JR CHNGE		FD10 C9	1690	RET	
	0449				1695		
FC5A 1152FC	0450	TABAT LD DE, TV2		FD11 7C	1700	ATTR LD A, H	
FC5D 100B	0451	JR TV1		FD12 0F	1710	RRCA	
	0452			FD13 0F	1720	AND	
FC5F 116FCF	0453	INNOV LD DE, CONT		FD14 0F	1730	RRCA	
	0454			FD15 E603	1740	AND 3	
FC62 320F5C	0455	TV1 LD (TVDTA), A		FD17 F658	1750	OR B8	
	0456			FD18 67	1760	LD H, A	
FC63 2A515C	0457	CHNGE LD HL, (CURCH)		FD1A E0B8F5C	1770	LD DE, (ATTRT)	
FC68 73	0458	LD (HL), E		FD1E 7E	1780	LD A, (HL)	
FC69 23	0459	INC HL		FD1F AB	1790	XOR E	
FC6A 72	0460	LD (HL), D		FD20 A2	1800	AND D	
FC6B C9	0461	RET		FD21 AB	1810	XOR E	
	0462			FD22 FDCB5776	1820	BIT 6, (IY+07)	
FC6C 11F4FB	0463	CONT LD DE, PRINT		FD26 2000	1830	JR 2, ATTR1	
FC6F CD65FC	0464	GALL CHNGE		FD28 E6C7	1840	AND 199	
FC72 2A0E5C	0465	LD HL, (TVDTA)		FD2A CB57	1850	BIT 2, A	
FC75 57	0466	LD D, A		FD2C 2002	1860	JR NZ, ATTR1	
FC76 70	0467	LD A, L					
FC77 FE16	0468	CP 22		FD2E EE38	1870	XOR 36	
	0469		"EXIT via ROM routine"	FD34 2000	1880	ATTR1 BIT 1, (IY+07)	
	0470		"for colour codes"	FD36 E658	1890	AND B8	
FC79 D41122	0471	JP C, TEMPS		FD38 CB6F	1900	BIT 5, A	
FC7C 201B	0472	JR NZ, TAB		FD3A 2002	1910	XOR 7, ATTR2	
	0473			FD3C EE87	1920	BIT 7	
FC7E 7A	0474	LD A, D		FD3E 77	1930	ATTR2 LD (HL), A	
FC7F E61F	0475	AND 31		FD3F C9	1940	RET	
FC81 4F	0476	LD C, A			1950		
FC82 3E1F	0477	LD A, 31		FD40 D5	1960	PSPC PUSH DE	
FC84 91	0478	SUB 24		FD41 D9	1970	EXX	
FC85 C602	0479	ADD 2		FD42 3A915C	1980	LD A, (PFLAG)	
FC87 4F	0480	LD C, A		FD45 F5	1990	PUSH AF	
FC88 7C	0481	LD A, H		FD46 3E20	2000	LD A, 32	
FC89 D610	0482	JR NC, AT1		FD48 FD365701	2010	LD B, (IY+07), 1	
FC8B 30FC	0483	JR 2, AT2		FD4C D7	2020	RST 16	
FC8D 2002	0484	LD B, A		FD4D F1	2030	POP AF	
FC8F C610	0485	LD A, 24		FD4E 32915C	2040	LD (PFLAG), A	
FC91 47	0486	SUB B		FD51 D9	2050	EXX	
FC92 3E10	0487	LD B, A		FD52 D1	2060	POP DE	
FC94 98	0488	SUB B		FD53 C9	2070	RET	
FC95 47	0489	LD B, A			2080		
FC96 C354FD	0490	JP SETCL			2085		"Find SCREEN POS."
	0491				2090		"from Line, Col."
FC99 7C	0492	LD A, H		FD54 78	2095	SETCL LD A, B	
FC9A CD87FC	0493	CALL FPOSN		FD55 C5	2100	PUSH BC	
FC9D 01	0494	ADD C		FD56 47	2110	LD B, A	
FC9E 3D	0495	DEC A		FD57 CD65FD	2120	CALL ADDR	
FC9F E61F	0496	AND 1		FD5A C1	2130	POP BC	
FCAB C8	0497	RET 2		FD5B 3E21	2140	LD A, 33	
FCAC 57	0498	LD D, A		FD5D 91	2150	SUB C	
	0499			FD5E 5F	2160	LD E, A	
FCAC CD48FD	0500	SPACE CALL PSPC		FD5F 1600	2170	LD D, 0	
FCAC 15	0501	DEC D		FD61 19	2180	ADD HL, DE	
FCAC 28FA	0502	JR NZ, SPACE		FD62 C3AEFC	2190	JP STORE	
FCAC 99	0503	RET			2115		
	0504			FD65 3E10	2120	ADDR LD A, 24	
FCAC F3	0505	PNTIT DI		FD67 98	2130	SUB B	
FCAB CDBFFC	0506	CALL PTALL		FD68 57	2140	LD D, A	
	0507			FD69 0F	2150	RRCA	
FCAC E043805C	0508	STORE LD (SPOSN), BC		FD6A 0F	2160	RRCA	
FCB2 22045C	0509	LD (DFCC), HL		FD6B 0F	2170	RRCA	
FCB5 F8	0510	EI		FD6C E6E0	2180	AND 224	
FCB6 C9	0511	RET		FD6E 6F	2190	LD L, D	
	0512			FD6F 7A	2200	LD D, D	
FCB7 E043805C	0513	FPOSN LD BC, (SPOSN)		FD70 E618	2210	AND 24	
FCB8 2A045C	0514	LD HL, (DFCC)		FD72 F640	2220	OR 64	
FCBE C9	0515	RET		FD74 67	2230	LD H, A	
	0516			FD75 C9	2240		
FCBF FE00	0517	PTALL CP 120			2245		
FCCL 300F	0518	JR C, CHAR		FD76 1154FD	2250	SCRL LD DE, SETCL	
FCCE F90B	0519	CP 144		FD79 D5	2260	PUSH DE	
FCCE D8	0520	RET C		FD7A 70	2270	LD A, B	
FCCE D6A5	0521	KUDG SUB 165		FD7B A7	2280	AND A	
FCCE D8	0522	RET NC		FD7C C8	2290	RET NZ	
FCCE C615	0523	ADD 21					

```

FD7D 212040 2295 LD HL,0020H
FD80 0600 2298 SCR LD B,6
FD82 E5 2310 SCR1 LD C,3
FD85 C5 2320 PUSH BC
FD86 E9 2340 SCR2 EX DE,HL
FD87 21E0FF 2350 LD HL,0FFE0H
FD8A 19 2360 ADD HL,DE
FD8B E9 2370 EX DE,HL
FD8C 012000 2380 SCR3 LD BC,32
FD8F ED00 2390 LDIR
FD91 7D 2400 LD A,L
FD92 A7 2410 AND A
FD93 20F1 2420 JR NZ,SCR2
FD95 212007 2430 LD HL,0720H
FD96 19 2440 ADD HL,DE
FD99 C1 2450 POP BC
FD9A 0D 2460 DEC C
FD9B C5 2470 PUSH BC
FD9C 20EE 2480 JR NZ,SCR3
FD9E AF 2490 KOR A

```

```

FD9F 0620 2500 LD B,32
FDA1 12 2510 CLN1 INC DE
FDA2 13 2520 INC DE
FDA3 10FC 2530 DJNZ CLN1
FDA5 C1 2540 POP BC
FDA6 E1 2550 POP HL
FDA7 24 2560 INC H
FDB8 1000 2570 DJNZ SCR1
FDBA 212050 2580 SCRAT LD HL,5020H
FDAD 110056 2590 LD DE,5000H
FDB8 01E002 2600 LD BC,736
FDB3 ED00 2610 LDIR
FDB5 3ADD5C 2620 LD A,(ATTPR)
FDB8 0620 2630 LD B,32
FDBA 12 2640 CLN2 LD (DE),A
FDBB 13 2650 INC DE
FDBC 10FC 2660 DJNZ CLN2
FDBE 210040 2670 RESET LD HL,0000H
FDC1 01201 2680 LD BC,0121H
FDC4 C9 2690 RET
2620 END

```

HEXDUMP for 48K ZX Spectrum

```

FBF4 CD B7 FC FE 20 D2 AA FC = 16
FBFC FE 06 D6 FE 10 D0 21 09 = EC
FC04 FC 5F 16 00 19 5E 19 E5 = E4
FC0C C3 B7 FC 42 41 40 3F 3E = B6
FC14 38 0C 2D 3A 39 46 45 44 = 83
FC1C 43 42 41 38 3A F3 21 00 = 4F
FC24 40 11 01 40 01 FF 17 36 = DF
FC2C 00 ED 00 23 13 01 FF 02 = D5
FC34 3A 8D 5C 77 ED 00 01 21 = 59
FC3C 18 21 00 40 C3 54 FD 0E = 9B
FC44 21 CD 76 FD 05 C3 54 FD = 7A
FC4C F3 CD 7D FD FB C9 11 6C = 7B
FC54 FC 32 0F 5C 18 00 11 52 = 1F
FC5C FC 18 03 11 6C FC 32 0E = 09
FC64 5C 2A 51 5C 73 23 72 C9 = 04
FC6C 11 F4 FB CD 65 FC 2A 0E = 66
FC74 5C 37 7D FE 16 DA 11 22 = 51
FC7C 20 18 7A E6 1F 4F 3E 1F = 66
FC84 91 C6 02 4F 7C D6 18 38 = 42
FC8C FC 28 02 C6 18 47 3E 18 = A1
FC94 00 47 C3 54 FD 7C CD B7 = EB
FC9C FC 01 3D 8A 1F C9 57 CD = AB
FCA4 40 FD 15 20 FA C9 F3 CD = F5
FCAE BF ED 43 00 5C 22 04 = 75
FCB4 5C FB C9 ED 4B 00 5C 2A = 66
FCBC 04 5C C9 FE 00 38 0F FE = 6C
FCC4 50 D0 D6 A5 D0 C6 15 C5 = 53
FCC6 ED 4B 78 5C 18 05 C5 ED = DE

```

```

FCD4 4B 36 5C EB 26 00 6F 29 = 86
FCD4 29 29 09 C1 EB 79 3D 3E = FB
FCE4 21 20 02 05 4F 39 05 CC = F1
FCEC 76 FD D1 C5 E5 3A 91 SC = 15
FCFA 06 FF 1F 30 01 04 0E 00 = 77
FCFC A7 EB 1A AF AE 12 14 23 = 43
FD04 00 20 F7 EB 25 CD 11 FD = 0F
FD0C E1 C1 00 23 C9 7C 0F 0F = 35
FD14 0F E6 03 F6 50 47 ED 5B = F5
FD1C 8F 5C 7E AB A2 AB FD CB = 29
FD24 57 76 28 00 EA C7 CB 57 = CC
FD2C 20 02 EE 38 FD CB 57 66 = CD
FD34 28 00 E6 50 CB 4F 20 02 = CA
FD3C EE 07 77 C9 D5 D9 3A 91 = AE
FD44 5C F5 3E 20 FD 36 57 01 = 3A
FD4C D7 F1 32 91 5C D9 D1 C9 = 5A
FD54 78 C3 47 CD 65 FD C1 3E = 02
FD5C 21 91 5F 16 00 19 C3 AE = B1
FD64 FC 3E 18 00 57 0F 0F 0F = 66
FD6C E6 00 6F 7A E6 18 F4 40 = E3
FD74 67 C9 11 54 FD D5 70 A2 = B6
FD7C C0 21 20 40 06 00 E5 0E = 42
FD84 83 C5 EB 21 E0 FF 19 EB = 87
FD8C 01 20 00 ED 00 7D A2 20 = 02
FD94 F1 21 20 07 19 C1 0D C5 = E5
FD9C 28 EE AF 06 20 12 13 18 = 10
FDA4 FC C1 E1 24 10 D0 21 20 = B9
FDAC 50 11 00 58 01 E0 02 ED = 91
FDB4 B0 3A 0D 5C 06 20 12 13 = 1E
FDBC 10 FC 21 00 40 01 21 01 = 90
FDC4 C9 = C9 END

```

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IN THE DARK

The plot thickens

Explore your artistic talents with *Scribble* written for the Amstrad by **Brian and David Lewis**

This program allows you to draw on the screen, either with a joystick, or by using the cursor controls. It shows you, amongst other things, the difference between mode 0 (20 column screen), mode 1 (40 columns) and mode 2 (80 columns) plus the maximum number of colours for each mode.

Modes can be toggled from the Enter key, with the mode number printed to the screen. The fire button (or copy key) prints out each colour (in that colour), whilst the screen can be cleared with the space bar.

Each mode change or screen refresh starts the cursor at 0,0 (ie, at the bottom left-hand side of the screen).

The flashing cursor lets you know where you are on the screen, which is particularly helpful when drawing in background colour.

Program Notes

Line 100 — initialisation
Line 110-140 — adjusts x and y co-ordinates
Line 150 — flashes cursor
Line 160-190 — changes pen colour
Line 200 — plots x and y
Line 210-220 — if space bar or enter, Gosub 300
Line 310-360 — adjusts mode, and associated parameters
Line 370 — restores x and y to 0,0
Line 380 — clears keyboard buffer

Line 400 — sets up variables
Line 410-470 — prints title page and instructions
Line 480-490 — configures for cursor or joystick control

Variables

cursor = value for on-screen cursor (either 0 or 1)
maxcolour = Maximum no. of pens in that mode
s\$ = value of key pressed
s = ASCII value of s\$
m = screen mode
jump = x co-ordinate for scaling screen to fit mode
colour = pen chosen
off = used with Inkey to detect key release
fire = keycode for fire button
copy = keycode for copy key
space = ASCII value of space bar
enter = ASCII value of enter key
Lines 110 to 230 comprise the main loop of the program. 299 to 390 clear screen and change mode. Lines 399 to 500 are the initialisation subroutine.

```

99      REM Amstrad scribble                      18/7/84          B. & D. Lewis
100     GOSUB 400:GOSUB 310:GOTO 180
110     IF INKEY(Up)=Pressed THEN y=y+2:GOTO 130
120     IF INKEY(down)=Pressed THEN y=y-2
130     IF INKEY(left)=Pressed THEN x=x-jump:GOTO 150
140     IF INKEY(right)=Pressed THEN x=x+jump
150     cursor=1-cursor:PLU! x,y,cursor
160     IF INKEY(changecolour)=off THEN 200
170     colour=colour+1:IF colour>maxcolour THEN colour=0
180     PEN colour:LOCATE 30,1:PRINT"Colour=";COLOUR
190     IF INKEY(changecolour)=Pressed THEN 190
200     PLOT x,y,colour
210     s$=INKEY$:IF s$="" THEN 110
220     s=ASC(s$):IF (s=Space OR s=enter) THEN GOSUB 300:GOTO 180
230     GOTO 110
240     END
299     REM SCREEN CLEAR & MODE CHANGE SUBROUTINE
300     IF s$=" " THEN CLS:GOTO 360
310     m=m+1:IF m=3 THEN m=0
320     MODE m
330     IF m=0 THEN maxcolour=15:jump=4
340     IF m=1 THEN maxcolour=3:jump=2
350     IF m=2 THEN maxcolour=1:jump=1
360     PEN 1:PRINT"Mode";m
370     x=0:y=0:colour=1
380     WHILE s$("<>"):"s$=INKEY$:WEND
390     RETURN
399     REM INITIALISATION SUBROUTINE
400     colour=1:off=-1:Pressed=0:fire=76:copy=9:space=32:enter=13
410     MODE 0
420     PEN 1:LOCATE 7,1:PRINT"Amstrad":PRINT" Scribble Program"
430     PEN 2:LOCATE 1,6:PRINT"Press":PRINT:PRINT"Or"
440     PEN 15:LOCATE 7,6:PRINT"FIRE BUTTON":LOCATE 4,8:PRINT"COPY KEY"
450     PEN 4:LOCATE 1,11:PRINT"Use cursor keys OR joystick to draw lines. Backg
round is always PEN 0 i.e. NO COLOUR MESSAGE"
460     PEN 9:PRINT:PRINT"SPACE BAR - CLEARS SCREEN":PRINT:PRINT"ENTER
KEY - CHANGES MODE"
470     PEN 3:LOCATE 4,24:PRINT"By D & B Lewis"
480     IF (INKEY(fire)=off AND INKEY(copy)=off) THEN 480
490     IF INKEY(fire)=Pressed THEN changecolour=76:up=72:down=73:left=74:right=75
ELSE changecolour=9:up=0:down=2:left=8:right=1
500     RETURN

```



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The brightest star in the sky, Sirius is magnitude -1.4. Care must always be taken to note the difference between a star's

apparent magnitude as we see it at its true distance from Earth, and its absolute magnitude as the star would appear at a distance of 10 parsecs from us. (A parsec being a unit of stellar distance corresponding to 3.26 light-years).

For instance, suppose you observe Sirius, you will find that its apparent magnitude is -1.4. By calculation, we find that its absolute magnitude is 1.4. Therefore, if Sirius was say 40 times its distance from Earth, it would not be the brightest star as its apparent magnitude would have changed, although its

absolute magnitude will stay the same. This makes the calculation of the absolute magnitude very important in astronomy.

The program consists of three main procedures.

ProcIntro is a simple text introduction of the concept of absolute magnitude.

ProcDataEntry asks for the distance of the star from the Earth (either in light-years or parsecs), the name of the star, and its apparent magnitude, assigning each its own variable.

Finally, *ProcCalculate* works out, then prints the absolute magnitude, using the equation in Line 370.

So, the program will work out the absolute magnitude of any star, as long as the distance (in light-years or parsecs) and the apparent magnitude from Earth is known.

```

10REM Absolute Magnitude/Electron
20REM John T W Beckett 1984
30ON ERROR REPORT:PRINT" at line ";ERL:END
40MODE6:VDU19,0,4;0;
50PROC_INTRO
60PROC_DATA_ENTRY
70PROC_CALCULATE
80INPUT" Do you wish to run this program again"YN$
90IF LEFT$(YN$,1)<>"N" AND LEFT$(YN$,1)<>"Y"VDU7:GOTO80
100IF LEFT$(YN$,1)="Y" THEN 40
110IF LEFT$(YN$,1)="N" THEN END
120DEFPROC_DATA_ENTRY:CLS
130INPUT" Enter stars name "SN$
140IF LEN(SN$)>40 VDU7:GOTO130
150INPUT" Enter stars distance "SD
160IF SD<1 VDU7:GOTO150
170PRINT" Enter unit of distance" "L=LIGHT-YEAR      P=PARSEC"
180INPUT U$
190IF LEFT$(U$,1)<>"L" AND LEFT$(U$,1)<>"P" THEN VDU7:GOTO180
200IF LEFT$(U$,1)="L" SD=SD*0.3068
210INPUT" Enter apparent magnitude "AP
220IF AP>1000 VDU7:GOTO210
230ENDPROC
240DEFPROC_INTRO
250PRINT"      CALCULATION OF ABSOLUTE MAGNITUDE"
260PRINT" The absolute magnitude of a star is the"
270PRINT" magnitude which a star would have if"
280PRINT" put at a distance of 32.6 light-years"
290PRINT" or 10 parsecs from us. It is a measure"
300PRINT" of the real brightness of a star."
310PROC_SPACE:ENDPROC
320DEFPROC_SPACE
330PRINTTAB(4,23)"Press 'SPACE BAR' to continue";
340REPEATUNTILGET=32:ENDPROC
350DEFPROC_CALCULATE
360B%=&2040A
370AM=AP+5-5*LOG(SD)
380CLS:PRINT"THE ABSOLUTE MAGNITUDE OF "SN$
390PRINT" IS "AM:ENDPROC
    
```

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The inner depths

Keith Poole concludes his QL Disassembler, the program that reaches parts other programs miss

The QL Disassembler is a program which will show you the inner depths of your QL's memory. The first part of the listing was printed last week, the remainder follows below.

Program Notes

The main loop in the program consists of a select statement, which calls the procedure asso-

ciated with each instruction group.

The procedures Group 0 to Group e decode each group of instructions as defined last week. Group m handles move instructions. User deals with the two user definable instructions (Group a and f) by printing udef. It assumes that these instructions take up a minimum 2 byte op-code.

The two functions Addr# and Raddr# decode the addressing mode of the instruction using two arguments reg and mde. Some instructions only

use a subset of these addressing modes, so Raddr# checks for these before calling Addr#.

Dec takes a hexadecimal string argument and returns the decimal equivalent. To use this function, remember to initialise a variable digits with the value 0123456789ABCDEF. The function can handle upper or lower case letters.

Hex# performs the opposite to Dec. It takes a numeric argument and returns a hexadecimal string.

Slice takes a bit slice from a number supplied, (eg, slice (240,2,3) returns a three bit number starting at bit two).

Group 4 contains the miscellaneous instructions, and so is the most complex of the procedures. To simplify it, two subgroups Sub8 and Sub14 were given their own procedures.

```

2790 IF slice(rest,6,2)=3 THEN
2800 IF bot MOD 2=1 THEN
2810 op#="mul5"
2820 ELSE
2830 op#="mulu"
2840 END IF
2850 op#="op#%" "%addr#(slice(rest,3,3),slice(rest,
0,3))&","d%&(bot DIV 2)
2860 ELSE
2870 IF rest DIV 8=0 AND bot MOD 2=1 THEN
2880 op#="abcd d%&(rest MOD 8)&","d%&(bot DIV 2)
2890 ELSE
2900 xx=4*(bot MOD 2)+slice(rest,3,5)
2910 SELECT ON xx
2920 ON xx=40:op#="exg d%&(rest MOD 8)&","d%&(bot DIV 2)
2930 ON xx=41:op#="exg a%&(rest MOD 8)&","a%&(bot DIV 2)
2940 ON xx=49:op#="exg d%&(rest MOD 8)&","a%&(bot DIV 2)
2950 ON xx=REMAINDER:op#="and"&type#(slice(rest,6,2))
2960 IF bot MOD 2=1 THEN
2970 op#="op#%" "d%&(bot DIV 2)&","%addr#(slice
(rest,3,3),slice(rest,0,3))
2980 ELSE
2990 op#="op#%" "%addr#(slice(rest,3,3),slice(rest
,0,3))&","d%&(bot DIV 2)
3000 END IF
3010 END SELECT
3020 END IF
3030 END IF
3040 END Define
3050 DEFINE PROCEDURE groupd
3060 IF (bot MOD 2=1) AND (slice(rest,3,3)=0) THEN
3070 op#="addx"&type#(rest DIV 64)& " d%&(rest MOD
8)&","d%&(bot DIV 2)
3080 ELSE
3090 IF (rest DIV 64)=3 THEN
3100 IF (bot MOD 2)=0 THEN
3110 op#="adda.w"
3120 ELSE
3130 op#="adda.l":lgt=1
3140 END IF
3150 op#="op#%" "%addr#(slice(rest,3,3),slice
(rest,0,3))&","a%&(bot DIV 2)
3160 ELSE
3170 IF type#(rest DIV 64)="l" THEN lgt=1
3180 IF (bot MOD 2)=0 THEN
3190 op#="addr#(slice(rest,3,3),slice(rest,0,3)
)&","d%&(bot DIV 2)
3200 ELSE
3210 op#="d%&(bot DIV 2)&","%addr#(slice(rest,
3,3),slice(rest,0,3))
3220 END IF
3230 op#="add"&type#(rest DIV 64)& " %op#
3240 END IF
3250 END Define
3260 DEFINE PROCEDURE groupe
3270 IF slice(rest,6,2)=3 THEN
3280 op#="addr#(slice(rest,3,3),slice(rest,0,3))
3290
3300 SELECT ON bot
3310 ON bot=0:op#="asr "%op#
3320 ON bot=1:op#="asl "%op#
3330 ON bot=2:op#="lrr "%op#
3340 ON bot=3:op#="lsl "%op#
3350 ON bot=4:op#="rorr "%op#
3360 ON bot=5:op#="roxl "%op#
3370 ON bot=6:op#="ror "%op#
3380 ON bot=7:op#="rol "%op#
3390 END SELECT
3400 ELSE
3410 IF slice(rest,5,1)=1 THEN
3420 op#="type#(slice(rest,6,2))& " d%&(bot DIV 2)& "
,d%&(rest MOD 8)
3430 ELSE
3440 p=(bot DIV 2):IF p=0 THEN p=8
3450 op#="type#(slice(rest,6,2))& " C%&p%&","d%&(rest
MOD 8)
3460 END IF
3470 xx=slice(rest,3,2)+4*(bot MOD 2)
3480 SELECT ON xx
3490 ON xx=0:op#="asr "%op#
3500 ON xx=1:op#="lrr "%op#
3510 ON xx=2:op#="rorr "%op#
3520 ON xx=3:op#="rol "%op#
3530 ON xx=4:op#="asl "%op#
3540 ON xx=5:op#="lsl "%op#
3550 ON xx=6:op#="roxl "%op#
3560 ON xx=7:op#="rol "%op#
3570 END SELECT
3580 END IF
3590 END Define
3600 DEFINE FUNCTION slice(dta,bit,LEN)
3610 RETURN (dta DIV 2^bit) MOD 2^LEN
3620 END Define
3630 DEFINE FUNCTION addr#(mde,reg)
3640 IF mde=7 AND (reg=0 OR reg=1) THEN
3650 RETURN "error"
3660 ELSE
3670 RETURN addr#(mde,reg)
3680 END IF
3690 END Define
3700 DEFINE FUNCTION addr#(mde,reg)
3710 LOCAL temp
3720 SELECT ON mde
3730 ON mde=1:RETURN "a"&reg
3740 ON mde=0:RETURN "d"&reg
3750 ON mde=2:RETURN "(a"&reg&)"
3760 ON mde=3:RETURN "(a"&reg&)+
3770 ON mde=4:RETURN "-(a"&reg&)"
3780 ON mde=5
3790 temp=PEEK_W(s+op):op=op+2
3800 RETURN hex#(temp)&("a"&reg&)"
3810 ON mde=6
3820 RETURN aiw#(reg)
3830 ON mde=7
3840 IF reg=0 THEN op=op+2:p=PEEK_W(s+op-2):RETURN
hex#(p)
3850 IF reg=1 THEN op=op+4:p=PEEK_L(s+op-4):RETURN

```

Continued over the page

```

hex$(p)
3870 IF reg=2 THEN op=op+2:p=256*PEEK(s+op-2)+PEEK
(s+op-1):RETURN hex$(p)&"(p
c)"&"!:"hex$(PEEK_W(s+op-2)+s+op)
3880 IF reg=3 THEN RETURN aiw$(8)
3890 IF reg=4 THEN RETURN "E"&hex$(peeker)
3910 ON mde=REMAINDER :agh=1:RETURN "error"
3920 END SELECT
3930 RETURN "error":agh=1
3940 END Define
3950 Define Function aiw$(reg)
3960 Local n1,n2,reg$
3970 n1=PEEK(s+op):n2=PEEK(s+op+1):op=op+2
3980 IF n1>127 THEN
3990 reg$="a"
4000 ELSE
4010 reg$="d"
4020 END IF
4030 reg$=reg$&slice(n1,4,3)
4040 IF slice(n1,4,1)=1 THEN
4050 reg$=reg$&".1"
4060 ELSE
4070 reg$=reg$&".w"
4080 END IF
4090 IF reg=8 THEN
4100 RETURN hex$(n2)&"("&reg$&","&pc")"
4110 ELSE
4120 RETURN hex$(n2)&"("&reg$&","&reg$&")"
4130 END IF
4140 END Define
4150 Define Function peeker
4160 IF lgt=1 THEN
4170 op=op+4:RETURN PEEK_L(s+op-4)
4180 ELSE
4190 op=op+2:RETURN 256*PEEK(s+op-2)+PEEK(s+op-1)
4200 END IF
4210 END Define
4220 Define Function type$(n)
4230 Select ON n
4240 ON n=0:RETURN ".b"
4250 ON n=1:RETURN ".w"
4260 ON n=2:RETURN ".1":lgt=1
4270 ON n=REMAINDER:RETURN "error":agh=1
4280 END Define
4290 Define PROCEDURE setup
4300 FOR i=0 TO 15:READ cc$(i)
4310 DATA "ra","sr","hi","ls","cc","cs","ne","eq","vc",
"vs","pl","mi","ge","lt","qt","le"
4320 END Define
4330 Define PROCEDURE sub8
4340 IF (rest DIV 128)=1 THEN
4350 IF slice(rest,3,3)=0 THEN
4360 IF slice(rest,6,1)=0 THEN
4370 op$="ext.w"
4380 ELSE
4390 op$="ext.1"
4400 END IF
4410 op$=op$&" d"&(rest MOD 8)
4420 ELSE
4430 IF (bot MOD 2)=1 THEN
4440 op$="movem.1":lgt=1
4450 ELSE
4460 op$="movem.w"
4470 END IF
4480 a=PEEK(s+op):d=PEEK(s+op+1):op=op+2
4490 op$=op$&addr$(slice(rest,3,3),slice(rest,0,3))&","
4500 IF slice(rest,3,3)=4 THEN
4510 xx=a:a=d:d=xx
4520 ot$=""
4530 FOR i=0 TO 7
4540 IF a/2<>a DIV 2 THEN ot$=ot$&"_a"&(7-i)
4550 IF d/2<>d DIV 2 THEN op$=op$&"_d"&(7-i)
4560 d=2*a DIV 2
4570 END FOR i
4580 op$=op$&ot$
4590 ELSE
4600 ot$=""
4610 FOR i=0 TO 7
4620 IF a/2<>a DIV 2 THEN ot$=ot$&"_a"&i
4630 IF d/2<>d DIV 2 THEN op$=op$&"_d"&i
4640 d=2*a DIV 2
4650 END FOR i
4660 op$=op$&ot$
4670 END IF
4680 END IF
4690 ELSE
4700 IF (rest DIV 64)=1 THEN
4710 op$="nbcd" &addr$(slice(rest,3,3),slice
(rest,0,3))
4720 ELSE
4730 IF slice(rest,3,3)=0 THEN
4740 op$="swap d"&slice(rest,0,3)
4750 ELSE
4760 op$="pea" &addr$(slice(rest,3,3),slice
(rest,0,3))
4770 END IF
4780 END IF
4790 END IF
4800 END Define
4810 Define PROCEDURE sub14
4820 xx=slice(rest,6,2)
4830 Select ON xx
4840 ON xx=3:op$="jmp" &addr$(slice(rest,3,3),slice
(rest,0,3))
4850 ON xx=2:op$="jsr" &addr$(slice(rest,3,3),
slice(rest,0,3))
4860 ON xx=1
4870 IF slice(rest,5,1)=0 THEN
4880 IF slice(rest,3,1)=0 THEN
4890 IF slice(rest,4,4)=4 THEN
4900 op$="trap C"&(rest MOD 16)
4910 ELSE
4920 op$="link a"&slice(rest,0,3)&","&"&PEEK
_W(s+op):op=op+2
4930 END IF
4940 ELSE
4950 op$="unlk a"&slice(rest,0,3)
4960 END IF
4970 ELSE
4980 yy=slice(rest,0,4)
4990 Select ON yy
5000 ON yy=0
5010 op$="reset"
5020 ON yy=1:op$="nop"
5030 ON yy=2:p=PEEK_W(s+op):op$="stop" &hex$(p):
op=op+2
5040 ON yy=3:op$="rte"
5050 ON yy=5:op$="rts"
5060 ON yy=6:op$="trapv"
5070 ON yy=7:op$="rtr"
5080 END Select
5090 END IF
5100 END Select
5110 END Define
5120 Define PROCEDURE movemf
5130 IF slice(rest,6,1)=1 THEN
5140 op$="movem.1":lgt=1
5150 ELSE
5160 op$="movem.w"
5170 END IF
5180 a=PEEK(s+op):d=PEEK(s+op+1):op=op+2
5190 op$=op$&addr$(slice(rest,3,3),slice(rest,0,3))&","
5200 ot$=""
5210 FOR i=0 TO 7
5220 IF a/2<>a DIV 2 THEN ot$=ot$&"_a"&i
5230 IF d/2<>d DIV 2 THEN op$=op$&"_d"&i
5240 a=a DIV 2:d=d DIV 2
5250 END FOR i
5260 END Define
5270 Define PROCEDURE dly
5280 CLS :PAPER 0,3:PRINT 0,"press any key to cont
inue":PAPER 0,0
5290 op$=INKEY$(1)
5300 CLS 0
5310 END Define
5320 Define PROCEDURE asc11
5330 INK 0
5340 IF col>10 THEN PRINT FILL$(" ",col-10):col=10
5350 FOR i=0 TO op-1
5360 IF PEEK(s+i)<32 THEN
5370 PRINT ". ";
5380 ELSE
5390 PRINT CHR$(PEEK(s+i));
5400 END IF
5410 col=col+1
5420 END FOR i
5430 INK 7
5440 END Define
9999 POKE_W dec("3eff2"),dec("23c0")

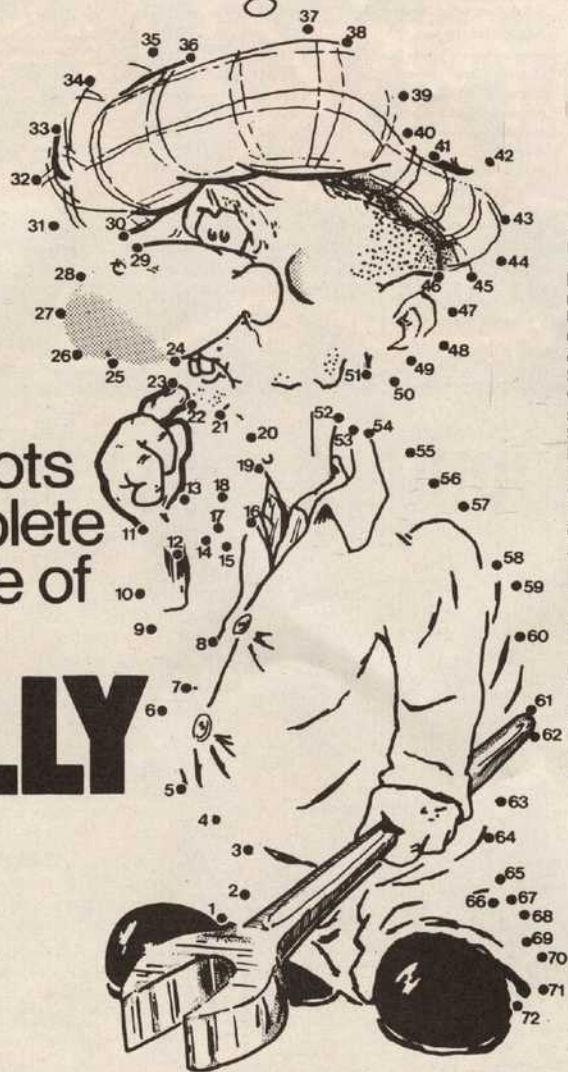
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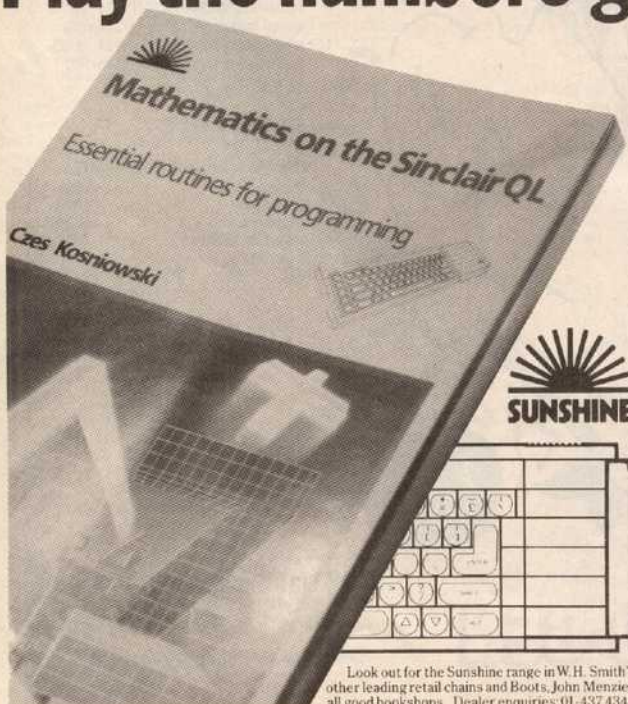
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Program Notes

C - Ship position
X - Rock X co-ordinate
Y - Rock Y co-ordinate
SC - Score
BN - Bonus
CL - Ship colour
G - Gap between each new position of ship

```

10 GOSUB 3100:REM**TITLE PAGE**
20 REM**SET UP GAME**
30 X=34276:Y=54277:K=54295:H=54273:L=54272
  V=53248:CL=1:U=1
60 GOSUB2200:GOSUB2500:GOSUB600:GOSUB740:
  GOSUB200:GOSUB300
90 REM**MAIN LOOP**
100 GOSUB700:GOSUB500:GOSUB900:GOTO100
200 REM**SET UP SPRITE 1 (ROCK)**
220 POKE2041,13
230 FOR T=0 TO 62:READS
250 POKE832+T,S:NEXT
270 POKEV+28,2:POKEV+39,1:POKEV+37,12:POKE
  V+40,15:RETURN
300 REM**SET UP SPRITE 0 (SUB)**
310 POKE2040,14
320 FOR T=0 TO 62:READS
340 POKE896+T,S:NEXT
360 POKEV+21,3:POKEV+39,0:POKEV+39,CL:POKE
  V+1,R:RETURN
400 REM**SURFACE SUB**
410 R=R-INT(G/2+1)
420 IF R<208 THEN R=208
430 POKE V+1,R:RETURN
450 REM**SUBMERGE SUB**
460 FOR R=208 TO 250 STEP0.1
470 POKE V+1,R
480 NEXT:POKE V,0:RETURN
500 REM**SELECT SHOT**
520 IF PEEK(197)=4 THENM=81:O=202:X=117:E
  =36:D=6:RETURN
530 IF PEEK(197)=5 THENM=82:O=232:X=86:E
  =27:D=5:RETURN
540 IF PEEK(197)=6 THENM=83:O=255:X=63:E
  =20:D=4:RETURN
550 GOSUB1000:FOR T=1TO(INT(S5/G)+18*G):
  NEXT:GOTO520
600 REM**PRINT SCENE**
605 PRINT"###";"#####"
610 PRINTTAB(30);"  "
620 PRINTTAB(7);"###"TAB(30);"
  "
630 PRINTTAB(5);"  "TAB(30);"  "
640 PRINT"### - - - - -"
  "
650 PRINT"### - - - - -"
  "
670 PRINT"  - - - - -"
  "
680 POKE53280,5:POKE53281,6:POKE2023,160:
  POKE56295,13:RETURN
700 REM**POSITION NEW ROCK**
710 O=160:X=157:Y=175:U=0:POKEV+30,0
720 GOSUB1100:GOSUB800:RETURN
740 REM**PRINT GIANT**
750 PRINT"#####"
755 PRINT TAB(36);" |  \ "
760 PRINT TAB(36);"  33  33  "
765 PRINT TAB(36);"  "  X "
770 PRINT TAB(36);"  1  \ "
780 RETURN
800 REM**POKE SPRITE POS**
820 POKEV+2,0+X-OF#256:POKEV+3,Y
840 IF(PEEK(V+30)AND3)=3THENGOSUB2000:
  GOSUB1800:GOSUB2300:GOSUB2500:U=1
850 OF=0:RETURN
900 REM**MOVE ROCK**
920 GOSUB1000:IF U=1 THEN RETURN
930 X=X-D:Y=INT(9*(X/E)+2)+M
940 GOSUB1100
950 IF Y>255 THEN RETURN
960 GOSUB800
970 IFU=1 THEN RETURN
980 GOTO920
1000 REM**MOVE SUB**
1010 C=C+G
1020 IF C>170 THEN GOSUB400
1050 IF C>200 THEN GOSUB2600
1060 IF C<0 THEN RETURN
1070 POKEV,C:RETURN
1100 REM**CHECK IF MSB REQUIRED**
1110 IF(X+O)<256 THEN POKEV+16,0
1120 IF(X+O)>255 THEN POKEV+16,(PEEK
  (V+16))OR2-OF=1
1130 RETURN
1200 REM**FIRE SUBS GUN**
1210 J=0:I=0
1220 IF PEEK(1848+J)=160 THEN POKE1848+J,
  32:FOR T=1 TO 50:NEXT:I=1
1240 IF PEEK(1808+J)=160 THEN POKE1808+J,
  32:POKE1848+J,160:I=1
1255 IF I=1 THEN RETURN
1280 POKE1848+J,100:POKE56120+J,8
1290 IF J=0 THEN GOSUB2400
1300 POKE1848+J,32
1310 IFO+X<317 THEN GOSUB930
1320 J=J+1:GOTO1220
1400 REM**KILL GIANT**
1410 PRINT"#####"
1420 PRINT TAB(36);"  \  / "
1430 PRINT TAB(36);"  33  "
1440 PRINT TAB(36);"  X  "
1450 PRINT TAB(36);"  /  \ "
1460 FOR T=0 TO 14
1470 POKE53281,T:NEXT
1480 POKE53281,6:POKEV,0:POKEV,0
1490 DUR=200:WF=129:NTE=5:B=3:GOSUB1600
1500 POKEV+21,0:POKEV,0:POKEV,0:RETURN
1500 REM**SOUND(VOICE 1)**
1610 FOR U=15 TO 8 STEP-1
1620 IF C<200 THEN POKEV+39,U
1630 POKEV,U:POKEV,WF

```

```

1640 POKE 63:POKE H,NTE:POKE L,85
1650 FOR Z=1 TO DUR:NEXT
1660 IF 0+XC317 AND C200 THEN GOSUB 930
1670 NEXT:RETURN
1680 REM***BLOW UP SUB***
1690 POKE V+3,255:UU=1
1700 DUR=75:NTE=2:WF=129:B=0:GOSUB 1600
1710 POKE W,0:POKE A,0
1720 GOSUB 1900:RETURN
1730 REM***FLASH SUB COLOUR***
1740 FOR Z=1 TO 15
1750 FOR T=1 TO 10:NEXT
1760 POKE V+39,Z:NEXT
1770 POKE V,0:RETURN
1780 REM***SCORING***
1790 SC=SC+200
1800 PRINT "SCORE";SPC(7);SC:BN:SC=SC+BN
1810 BN=BN+50
1820 GOSUB 2100:RETURN
1830 REM***BONUS***
1840 PRINT "BONUS";SPC(32);"
1850 PRINT "BN";SPC(32);BN
1860 RETURN
1870 REM***SCORE/BONUS DISPLAY***
1880 PRINT "SCORE= 0",SPC(17);"BONUS= 0"
1890 PRINT "BN"
1900 RETURN
1910 REM***CHANGE SUB COLOUR***
1920 CT=CT+1:HH=5+INT(CT/10)
1930 F=INT(HH*RND(1))
1940 IF F=0 THEN CL=1:G=1
1950 IF F=1 THEN CL=3:G=1.5
1960 IF F=2 THEN CL=9:G=2
1970 IF F=3 THEN CL=7:G=3
1980 IF F=4 AND F<7 THEN CL=0:G=4
1990 IF F=7 THEN CL=2:G=5
2000 POKE V+39,CL:RETURN
2010 REM***LAZER SOUND***
2020 DUR=5:WF=33:B=15:NTE=100
2030 GOSUB 1600:RETURN
2040 REM***DELAY BETWEEN SUBS***
2050 R=225:POKE V+1,R
2060 P=INT(RND(1)*7)
2070 IF P>3 THEN C=7:RETURN
2080 C=-INT(P*10*G):RETURN
2090 REM***EXPLOSION***
2100 UU=1:GOSUB 1200:BN=0:GOSUB 2100
2110 IF J>11 THEN GOSUB 1400:GOSUB 3000
2120 DUR=120:NTE=10:WF=129:B=0:GOSUB 1600
2130 POKE W,0:POKE A,0:J=0
2140 IF 0+XC317 AND YC255 THEN GOSUB 930:
GOTO 2670
2150 GOSUB 460:GOSUB 2300:GOSUB 2500:RETURN
2160 REM***GAME OVER***
2170 PRINT "GAME OVER"
2180 PRINT TAB(12);"GAME OVER"
2190 PRINT TAB(6);"YOU SCORED";SC,
"POINTS"
2200 PRINT TAB(6);"PRESS ANY KEY
TO RESTART"
2210 POKE 198,0:WAIT 198,1:G=0:RUN 30
2220 REM***TITLE PAGE***
2230 PRINT "J":POKE 53281,13:POKE 53280,5
2240 PRINT TAB(10)
2250 PRINT "MINI-SUB CONQUEST"
2260 PRINT TAB(10);"*****"
2270 PRINT "THE LAND OF THE GIANTS IS
UNDER ATTACK"
2280 PRINT "FROM ALIEN MINI-SUBS,AS GIANT
LEADER,"
2290 PRINT "YOUR ONLY DEFENCE IS TO HURL
HUGE ROCKS"
2300 PRINT "AT THE SUBS AS THEY ADVANCE
JUST BENEATH"
2310 PRINT "THE SURFACE,"
2320 PRINT "YOU SCORE 200 PTS FOR EACH SUB
PLUS A"
2330 PRINT "BONUS WHICH INCREASES BY 50 PTS
FOR EACH HIT,"
2340 PRINT "FOR LONG THROW,PRESS KEY F1"
2350 PRINT "FOR MEDIUM THROW,PRESS KEY
F3"
2360 PRINT "FOR SHORT THROW,PRESS KEY
F5"
2370 PRINT "IF A SUB GETS THROUGH,IT WILL
SURFACE"
2380 PRINT "AND DESTROY PART OF YOUR
DEFENSIVE WALL,"
2390 PRINT "THE BONUS IS THEN RESET"
2400 PRINT TAB(4);"PRESS ANY KEY"
2410 POKE 198,0:WAIT 198,1:RETURN
2420 REM***DATA FOR SPRITE 1(ROCK)***
2430 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
2440 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
2450 DATA 0,13,0,0,62,64,0,63,64,0,255
2460 DATA 144,0,255,144,0,255,144,0
2470 DATA 255,144,0,255,80,0,254,80,0
2480 DATA 57,64,0,37,64,0,5,0,0
2490 REM***DATA FOR SPRITE 0(SUB)***
2500 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
2510 DATA 0,12,0,0,8,0,0,8,0,0,8,0
2520 DATA 0,8,0,0,28,0,0,28,0,0,20,0
2530 DATA 0,28,0,0,28,0,33,255,128
2540 DATA 127,255,192,127,182,224
2550 DATA 127,255,192,33,255,128,0,0,0
2560 DATA 0,0,0
2570 :
2580 :
2590 REM*****
2600 REM*****
2610 REM***
2620 REM*** MINI-SUB CONQUEST ***
2630 REM***
2640 REM*** BY STEVE PHILLIPS ***
2650 REM***
2660 REM*** COMMODORE 64 ***
2670 REM***
2680 REM*** 2ND APRIL 1984 ***
2690 REM***
2700 REM*****
2710 REM*****

```

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Open Forum

Open Forum is for you to publish your programs and ideas. Take care that the listings you send in are all bug-free. Your documentation should start with a general description of the program and what it does and then give some detail of how the program is constructed.

Windows

on QL

This program is designed to illustrate the Window facility on the QL. Four new

windows will be opened, one in each corner of the screen, covering the whole of the display area. In each window a different type of graphical pattern is drawn; these patterns are described below.

In the top left hand corner, filled circles

are drawn at random positions in random colours. In the top right hand corner filled squares are drawn at random positions in random colours. In the bottom left hand corner filled ellipses are drawn and in the bottom right hand window filled triangles are drawn at random positions in random colours. A border is also set up around each window.

The program will Run indefinitely, and should be stopped by pressing **Ctrl** and **Space** together.

```
100 REMARK WINDOWS BY ANDREW FILBY
110 OPEN#5,scr_256x128a0x0
120 PAPER#5,0:CLS#5
130 INK#5,7
140 BORDER#5,15,1
150 SCALE#5,100,0,0
160 OPEN#6,scr_256x128a256x128
170 INK#6,0
180 PAPER#6,2:CLS#6
190 BORDER#6,15,3
200 SCALE#6,100,0,0
210 OPEN#7,scr_256x128a256x0
220 INK#7,0
230 PAPER#7,7:CLS#7
240 BORDER#7,15,5
250 SCALE#7,100,0,0
260 OPEN#8,scr_256x128a0x128
270 INK#8,0
```

Arcade Avenue



Room to move

Continuing on the subject of *Jet Set Willy* hacking from last week — here is Ben Caunce's table showing the memory locations of the various rooms.

Address (Hex)	Room Title
C000	Off Licence
C100	The Bridge
C200	Under Megatree
C300	Foot of Megatree
C400	The Drive
C500	Security Guard
C600	Entrance to Hades
C700	Cuckoo's Nest
C800	Inside Megatree
C900	Branch Over Drive
CA00	Front Door
CB00	Hall
CC00	Tree Top
CD00	Out On A Limb
CE00	Rescue Esmeralda
CF00	Seen This Before
D000	Quirkaflegg
D100	Battlements
D200	Pn Roof
D300	Forgotten Abbey

D400	Ballroom East
D500	Ballroom West
D600	Main Stairway
D700	Kitchen
D800	West of Kitchen
D900	Cold Store
DA00	East Wall Base
DB00	Chapel
DC00	First Landing
DD00	Nightmare Room
DE00	Banyan Tree
DF00	Swimming Pool
E000	Half Way Up East Wall
E100	Bathroom
E200	Top Landing
E300	Master Bedroom
E400	Bit Of Tree
E500	Orangery
E600	Priest's Hole
E700	Generator Room
E800	Dr. Jones
E900	The Attic
EA00	Under The Roof
EB00	The Conservatory
EC00	On Top Of House
ED00	Under The Drive
EE00	Tree Root
EF00	NOT USED
F000	Nomen Luni
F100	Wine Cellar
F200	Watchtower
F300	Tool Shed
F400	Back Stairs
F500	Back Door
F600	West Wing
F700	West Bedroom
F800	West Wing Roof
F900	Above West Bedroom
FA00	The Beach
FB00	The Yacht
FC00	The Bow

What I find particularly interesting is the room at EF00 which is not used. Using the information given in this article it seems not impossible that you could add your own room to the game. If anyone is clever enough to do this or even uses one of the 'JSW Designer' programs I mentioned a few weeks ago, then I'll see about arranging a small prize for the best 'new room'. Anyway let's go on with Ben's letter which has still more useful tips. "I have also found a hidden object on the First Landing which is impossible to reach without modifying the room layout. To alter the room and retrieve it as you walk towards the cross *Poke* 53642,0; *Poke* 56350,0; *Poke* 56357,170.

The following *Pokes* are also useful (some are necessary). *Poke* 42183,11 and *Poke* 59901,82 will remove the Attic problems (and Graeme Carrot also points out that *Poke* 59900,255 will do the same). *Poke* 56876,4 improves the Banyan Tree layout. *Poke* 60231,0 improves the 'conser-

vatory' layout. *Poke* 50552,170 and 50553,170 blocks off the 'Entrance to Hades' (who wants to go there?). *Poke* 50512,168; 50520,168 and 50528,170 puts a ledge in the 'security Guards' so that you can get under the Drive without going through the Forgotten Abbey. *Poke* 54814,0 removes the annoying 'star' on the Main Stairway. *Poke* 57411,160; 57362,26; 57464,170 makes life a little safer in Priest's Hole. The following *Pokes* make it possible to travel from The Bow to Off Licence and vice versa — *Poke* 64610,21; 64632,85; 64633,85; 64634,85; 64635,4; 49386,60; 49263,0; 49271,0."

So thank you very much, Ben for that fascinating letter.

Tony Kendle

The Arcade Corner is a new section for anyone who enjoys playing arcade games. If you have any comments, from playing tips on difficult games or programs you'd particularly like to praise (or blame) then write to: Tony Kendle, Arcade Avenue, Popular Computing Weekly, 12-13 Little Newport Street, London WC2R 3LD.

```
280 PAPER#8,4:CLS#8
290 BORDER#8,15,5
300 SCALE#8,100,0,0
310 INK 7:CURSOR 40,103:FLASH 1:CSIZE 3,1:PRINT"WINDOWS BY ANDREW FILBY":*F
LASH 0
320 REPEAT loop
330 window_1
340 window_2
350 window_3
360 window_4
370 END REPEAT loop
380 DEFINE PROCEDURE window_1
390 INK#5,RND(0 TO 7):FILL#5,1:CIRCLE#5,RND(0 TO 149),RND(0 TO 150),RND(0 T
O 50):FILL#5,0
400 END DEFINE
410 DEFINE PROCEDURE window_2
420 FILL#6,1:INK#6,RND(0 TO 7):a=RND(0 TO 100):i=RND(0 TO 149):LINE#6,1,a T
O RND(0 TO 148),RND(0 TO 100) TO RND(0 TO 148),RND(0 TO 100) TO 1,a:FILL#6,
0
430 END DEFINE
440 DEFINE PROCEDURE window_3
450 a=RND(0 TO 100):w=RND(0 TO 149):a=RND(0 TO 70)
460 INK#7,RND(0 TO 7):FILL#7,1:LINE#7,1,a TO 1,a+e TO 1+a,a+e TO 1+a,a TO 1
,a:FILL#7,0
470 END DEFINE
480 DEFINE PROCEDURE window_4
490 FILL#8,1:INK#8,RND(0 TO 7):CIRCLE#8,RND(0 TO 149),RND(0 TO 100),RND(0 T
O 50),RND(0 TO 2*PI):FILL#8,0
500 END DEFINE
```

**Windows
by A Filby**

Baud Walk



Special interest

If you spend a lot of time trying to contact people on the telephone, you will have noticed that the chances are that only one in three calls actually get you through to the person you want to chat to.

And its even more annoying and expensive when you are making a long distance call.

Well, now the UK's cheapest electronic mail service — which was previously only available in London — has been extended nationwide.

That means that for the price of a local telephone call and a small subscription of £20 per year you can get on to electro-

nic mail, send messages, greetings, arrange blind dates and talk to other baud walkers.

The system actually sits on the Prestel network and at only £20 a year its almost worth joining just to access the Pico-tel pages. There are at least another 10,000 micro users hooked up too, courtesy of the Micronet 800 service.

The electronic mail system on Prestel comes complete with a directory of other users and a number of special interest groups.

Every subscriber is given an individual 10-digit address number which you complete on pre-formatted pages — most message pages take up to 120 words a time.

Viewdata software marketed by a number of companies with their modems also allows you to prepare your messages before going on-line, thus cutting out even more telephone costs.

I use this mailbox facility frequently to get in touch with people on the move or when I'm at home tinkering with my micro at midnight and run into problems I have sometimes mailboxed somebody on the network I know who might have the answer. Invariably next day there is their reply sitting in my mailbox store — ready for me to use, save back to store or delete from the system.

The biggest advantage for baud walkers on electronic mail systems is the special interest groups. Nobody has yet devised a directory of category of index, that would be really useful. Imagine being able to mailbox everybody, for example, who was struggling with a particular adventure game — every one could help each other to solve the puzzles.

Imagine too, starting your own special interest group.

You could post the message on any one of Prestel's notice board services, collect the replies and from then on run your own club, all via electronic mail.

The disadvantage of this cheap form of electronic mail is its limitations — but then you can't have everything. Expect too, some report about junk electronic mail.

● Next week: the UK's cheapest 300/300 modem is launched.

Robin Wilkinson

Baud Walk is a new weekly column with news on networking, databases, reviews of modems and software and points of contact for information.

Any readers with experience of networking are asked to send their experiences or news of services to: Robin Wilkinson, Baud Walk Popular Computing Weekly, 12-13 Little Newport Street, London WC2R 3LD.

He can also be contacted on Prestel mailbox 018993727.

Matrice

on Vic 20

This unexpanded program should be easily adopted for any 'Basic speaking' machine. It consists of two programs which are joined together. Each one can be used separately.

(1) The first program is located between lines 90-940 (and includes the subroutine in

1500). It allows you to enter a matrice and it will calculate the determinant and the inverse matrice.

(2) The second program is located between lines 970-1430. It will multiply 2 matrices given by the user.

Example

$3x+5+z=1$
 $z+2y+3z=0$
 $12x+3y-z=1$

Type '1' to get the first program. The computer will ask you the size of the matrice which is here 3. Type in 3. Then introduce 3/3/1/1/2/3/2/3/-1. You'll get 1 as determinant of the system. Then you'll get the inverse matrice.

Press '1' to go on with equation of any offer key to stop. If you pressed '1', you are asked for the 3 numbers following the = sign which are 1, 0 and -1. Enter them and you'll get the result.

```
1 rem *****
2 rem * matrices *
3 rem *****
4 rem * copyright *
5 rem * caril aubry *
6 rem *****
7 rem * october '83 *
8 rem *****
9 PrintChr$(14)
82 Print"Matrices":Print"Menu":Print"
83 Print"1.To calculate":Printtab(4)
84 Printtab(4)"2-Inverse matrix"
84 Printtab(4)"3-Equations":Print"2.To multiply a(P,n) & b(Q,P)
96 Geta$:ifa$(1)and$a$(2)then86
97 ifa$="1"thenrun90
98 ifa$="2"thenrun970
99 rem calculates the determinant of a sized n matrix
100 Print"n"
110 Print"Size of matrix a:"
120 Input n
130 dima(n,n)
140 dimb(n,n)
150 dimc(n,n)
160 dimd(n,n)
170 forl=1ton
180 forc=1ton
190 Print"a(;"l;";"c;)"
200 Inputa(l,c)
```

```
210 b(l,c)=a(l,c)
220 nextc
230 nextl
240 rem results-inverse matrix
250 Print"n"
270 forq=1ton-1
280 gosub1500
290 forz=1ton
300 b(z,z)=b(z,z)-s/q
310 nextz
320 forl=1ton
330 forc=1ton
340 forz=1ton
350 d(l,c)=d(l,c)+a(l,z)*b(z,c)
360 nextz
370 nextc
380 nextl
390 forl=1ton
400 forc=1ton
410 c(l,c)=b(l,c)
420 b(l,c)=d(l,c)
430 d(l,c)=0
440 nextc
450 nextl
460 nextq
470 gosub1500
480 c=1
490 forz=1ton-1
500 c=-c
510 nextz
```

Sound chip

We all know about the revolution brought about in the few years that followed Intel's introduction of the first microprocessor chip — the antique 4040, best known as the progenitor of a million games of video tennis. The 4040 is now seen with something approaching religious awe.

As far as computer music is concerned, similar veneration probably awaits another chip — General Instrument's AY-3-8910 which, along with its somewhat less elaborate stablemate, the AY-3-8912, was probably the first fully digital programmable sound generator to reach the market-place. The 8912 is built in to the Oric 1 and Oric Atmos, while the 8910 is the chip chosen by the MSX manufacturers for their standard sound output features.

These chips have been po-

pular with home constructors for some time, as has the Texas Instrument's near-equivalent, the SN76489, which is the chip used in the BBC micro to produce sound.

Most current PSGs are fairly simple devices. The 76489, for example, isn't even properly addressable — it is, effectively, connected to an eight-bit data bus and the registers within it (the three tone generators and one noise generator) are addressed via this bus. If the chip had to have a large number of facilities, such an approach would be impossibly time consuming.

As a result, the features of these basic chips are extremely limited. Nonetheless, the principle of the PSG allows us, in theory, to produce an entire synthesiser on a single chip and to control it from software.

The most advanced PSG in common use is the Mostek 6581, available only on

Commodore machines. Commodore Basic, being what is, makes handling the 6581 an extremely tedious matter (there are 29 different registers in the chip which must be individually Poked or Peeked to make anything happen). But then there are an increasing number of hardware and software add-ons to enable you to get the most out of this remarkable chip.

Just one item of news in this connection. The designer of the 6581 was a certain Bob Yannes. Bob left MOS Technology (the Commodore-owned company which produces Mostek chips) some time ago. Recently, he and his brother Dave have surfaced at the helm of a company called Peripheral Visions Inc. (Great Valley Parkway, Malvern, Pennsylvania 19355, USA). PVI have just announced an Apple add-on called the DrumKey — apparently everything you ever

wanted from a drum synth and selling at only \$339.95.

Percussion synthesis is certainly one of the current things for the serious computer musician and it will be interesting to see whether the DrumKey (which includes a new Yannes-designed custom chip) comes up to the same standard in this area that the 6581 has set in the PSG field. To hear the device at 3000-miles' distance, you can ring 0101-215-647-3930.

Gary Herman

The Music Box

The Music Box is a new weekly column with news, reviews and readers comments on all aspects of micros and music.

Any readers with experience of computer music making or companies with new product news are invited to write to: drop a line explaining what they're doing to: Gary Herman, The Music Box, 12-13 Little Newport Street, London WC2R 3LD.

```

520 z=s/n*c
550 Print " The determinant of A is:";z
560 if z=0 then goto 940
570 Print "The inverse matrix is:"
580 for l=1 to n
590 for c=1 to n
610 c(l,c)=c(l,c)*n/s
620 Print " inv("";l";":c";")=";int(100*c(l,c))/100
630 next c
640 next l
700 Print "Solve in order to solve
equations "
Print "type '1' "
710 geta: if a$="" then 710
711 if a$="1" then end
730 Print "S"
740 Print "enter results y"
750 dim y(n)
760 dim x(n)
770 for l=1 to n
780 Print y(l);": ";
790 input x(l)
800 next l
810 Print "S"
820 Print " The solutions of
these equations are:"
830 for l=1 to n
840 for c=1 to n
870 x(l)=x(l)+c(l,c)*y(c)
880 next c
890 Print tab(8);x(l);": "
Print(100*x(l))/100
900 next l
901 for tt=1 to 3000:next: goto 82
940 Print " What a funny "
matrix !!! "
for tt=1 to 2000:next: goto 82
970 rem multiply matrices
980 Print "S"
990 Print "matrix a";": "number de nous";
1000 input x
1010 Print "number of columns";
1020 input y
1040 for p=1 to x
1050 for n=1 to y
1060 Print "a("";p";":n";")=";
1070 input a(p,n)
1080 next n
1090 next p
1110 Print "matrix b";": "number de nous";
1120 input y
1130 dim b(y,x)
1140 for p=1 to y
1150 for n=1 to x
1160 Print "b("";p";":n";")=";
1170 input b(p,n)
1180 next n
1190 next p
1230 dim c(y,y)
1240 for p=1 to y
1250 for n=1 to x
1260 for k=1 to x
1270 c(p,n)=c(p,n)+b(p,k)*a(k,n)
1280 next k
1290 next n
1300 next p
1330 x=y: Print "S"
1350 for p=1 to y
1360 for n=1 to x
1370 Print "c("";p";":n";")=";c(p,n)
1390 a(p,n)=c(p,n)
1400 next n
1410 next p
1430 end
1500 s=0
1510 for z=1 to n
1520 s=s+b(z,z)
1530 next z
1540 return

```

Matric
by Cyril Aubry

Microradio

GW6JJN



Answer back

A large number of readers have enquired about radio teletype (RTTY) programs for the Commodore 64 computer. More and more radio software is coming along for this machine and about the best RTTY program I have seen comes from Grosvenor Software of 22, Grosvenor Road, Seaford, East Sussex, BN25 2BS.

The program's title is *RTTY Transceiver* for the Commodore 64 and is available either on cassette at £14 or disc at £16. Written entirely in machine code, the program is

professionally presented and includes extensive instructions on how to use the facilities available, and there are plenty of those. In addition to the program, the user will need a suitable RTTY terminal unit/interface between the computer and the radio. Many of you will already have one, but if not a unit including all leads is available from PNP Communications in conjunction with Grosvenor. Ring 0323 893378 for more details.

The program operates in split-screen mode. This means that in-coming messages are received at the top part of the screen and you are able to compose a reply during receive, the reply being stored in a 1000 character buffer and displayed in the lower half of the screen. When you are ready to transmit you press a key and out goes your response. You can type ahead during transmission or you can send previously prepared pages of text which can be stored in any

of ten memories of 480 characters.

The selection of baud rate is software controlled between 20 and 250 baud. This will cope with just about everything in RTTY. The really cunning thing about this program is that it will tell you the baud rate of an incoming signal. I found this very impressive, it is something I have never seen before in such a package and is typical of the attention to detail displayed throughout.

Other features include automatic answer-back for radio mailboxes, in-built call-sign of user, the ability to remember all received and transmitted messages for later review. The function keys on the 64 are used for control of the major aspects of the program such as receive, transmit etc and a real-time clock is constantly displayed on screen and is available to send. On the whole this is a well thought-out program which is both efficient and easy to use. The features of

the Commodore 64 have been used to full effect indicating that it has been written specially for the 64 and not cobbled together from a bunch of routines intended for something else.

There is a great deal of radio software appearing recently but I can honestly say that very little of it compares in features or quality to Grosvenor's RTTY for the Commodore 64. Here we have the unique combination of the ultimate in radio software along with excellent value for money. Another winner from the author, M J Kerry G4BMK.

Ray Berry GW6JJN

This series of articles is designed for radio and microcomputer enthusiasts alike. If you have any queries that you want answered, hints and tips to share, or topics that you would like to see covered, write to: Ray Berry, Microradio, Popular Computing Weekly, 12-13 Little Newport Street, London WC2R 3LD.

Tony Bridge's Adventure Corner



Rubic's cube

Although we still have a lot of new adventures to get through (they're coming in thick and fast now — but should we complain?), I'm going to put them on one side for a week, and give some badly-needed help.

Now that the Infocom adventures are at last available for a reasonable £11 or so (although, of course, only on disc drive — don't hold your breath for tape versions, it's probably not possible!) — many more adventures are being introduced to the delights of the *Zork Trilogy*, *Planetfall* and *Deadline* among others. Mr D Feal of London N1 went out and bought the whole trilogy. *Zork I* brings the following problems with it: "How do I pass Hage's entrance? 11,29 and 41. "And how do I open the granting in the forest?" You'll need the 32,15,46,45.

As for *Zork III*: "What is the secret of the Puzzle Room? A difficult one to answer, Mr Feal! Suffice to say that the whole thing is rather like a giant Rubic's Cube, and the minimum number of moves — worked out with the aid of an algorithm constructed by Ken Matthews and friends — is 60 moves. The end result must be to move a ladder beneath a hole in the ceiling. "How do I get the Crown Jewels?" You only need a small item from the Jewels, but 34,5,27,42. How do I get across the lake without getting my lamp wet?" 6,38! "How do I get through the rubble?" 34,28,14,19. "And finally, I kept coming across a Viking ship with an old

sailor on it. How do I board the ship?" This is a lovely example of why the Infocom adventures are so much more interesting than most others: in *Zork I*, the player will find a book, in the temple. This says "Beware of saying Hello Sailor!" Working through the trilogy, one cannot resist the temptation, of course, to say just that at every opportunity! So, at this point, there's only one thing to do, isn't there?

As for your question about where to get hint sheets for Infocom games, my copies of the Infocom games (which I bought for a long time ago for, unfortunately, rather more than £11), go into great detail about the Infocom Hint Book and Nifty Map for each adventure — they're \$7.95 each (plus tax and postage). Unless the Commodore versions are very different, you'll find the address in the documentation.

Mr R A C Garway, from Swindon, has invested recently in a disc drive for his CMB64, and a copy of the complete trilogy. He has collected 16 of the 20 treasures, but is now stuck. You've done very well, especially in getting the pot of gold and the huge diamond, but it is the jewelled egg which is holding you up now. There is a treasure lying within which you cannot get out — you'll need to get someone else to do the job for you, so 12, 26, 44, 16, 20, 46, 3, 36, 26. Incidentally, have you looked in the buoy, in the river?

From a trilogy on the Commodore, to a trilogy on the Spectrum — the *Ket Trilogy* has won an awful lot of fans, all trying, no doubt, for that video recorder that is the prize awaiting the first person to finish the *Final Mission* (if you see me wandering around with a load of smelly old hay, give me a wave!). David Bryan writes to me from Middlesbrough about the first two parts, *Mountain of Ket* and *Temple of Vran*. In the first, he asks: "How do I get past the skull?" This is the final puzzle, David, as you may know. Although you say that you have got many objects with you, only three are

needed — 46,10,39,16,13. You'll find the first in the south plateau, the second in the little-used room and the third in the mountains. As for the rope in *Temple of Vran*, tell your Dad, David, that he needs to 34,7,2,16,21,48 — then tie rope and down. *Lords of Time* about which I have had many letters is still a great favourite, and I shall devote a whole page to this great program soon. But for now, let me address just a couple of problems. "I must congratulate Sue Gazzard on the most exciting adventure game that I have tackled," says Mrs M Roberts of Pickering. "How do I open the door to the invention room on zone 3?" 47,22. "Can I do anything with the Viking long-ship?" 49. "Can I get past the scorpion, squids or seaweed in zone 4? And where is the treasure trove, mentioned on the parchment?" 49 and 35,8,34,24,16,50. "How do I get rid of The Black Knight and where is the sharp sword in zone 5?" 1,43,7,37 — 46,18,33,23,1,26.

Finally she says: "In *Artic's Golden Apple*, what do I do with the computer?" Just think of what the deranged parrot is saying, and act on it!

Finally, the clue I gave to complete *Temple of Vran* — two weeks ago — was actually the clue to complete *Mountains of*

SCORE=1%

We are near a door in the east wall. It is 8' tall and made of thick oak. There is a glass window above it.

>OPEN DOOR

It is locked!

>EXAMINE WINDOW

Yep! It's a glass window!

>BREAK WINDOW

You cannot reach the glass.

>←

Ket. You must have the Magic Sword, the magic Armour, the Magic Ring and the magic Wand — drop everything else.

Clue Words: 1 Give 2 Cliff 3 Thief 4 Get 5 Back 6 Drop 7 To 8 Stone 9 Time 10 Hat 11 Bell 12 Carry 13 Beard 14 Before 15 From 16 And 17 In 18 Snow 19 Earthquake 20 Let 21 Feed 22 Eureka! 23 Will 24 Up 25 Down 26 It 27 Into 28 Through 29 Book 30 Crossing 31 Machine 32 Key 33 Queen 34 Go 35 Push 36 Nick 37 Prince 38 Lamp 39 Cloak 40 Before 41 Candle 42 Past 43 Sword 44 Around 45 Maze 46 The 47 Say 48 Elephant 49 No! 50 Easy.

This series of articles is designed for novice and experienced Adventurers alike. Each week Tony Bridge will be looking at different Adventures and advising you on some of the problems and pitfalls you can expect to encounter. So, if you have an Adventure you want reviewed, or if you are stuck in an Adventure and cannot progress any further write to: Tony Bridge, Adventure Corner, Popular Computing Weekly, 12-13 Little Newport Street, London WC2R 3LD.

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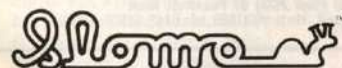
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Morse translator

C Parkes of Southend writes:

Q A few weeks ago your magazine published an address relating to a morse-code translator. grateful if you could either re-publish it or possibly send it to me.

A The program to which I think you refer was reviewed in the Microradio column in Vol. 3 No 22 (31st May). It is available from: Pinehurst Data Studios, 69 Pinehurst Park, West Moors, Wimbourne, Dorset BH22 0BP. The price for the ZX81 version is £7.00. I do not have a price for the Spectrum version.

Columns of keys

Robert Somerville of Dumfries, writes:

Q I own an 18 month old Spectrum, which is now out of guarantee. I wish to purchase a new keyboard membrane for it, as a column of keys has stopped working. Could you give the name of a company that would supply these membranes by mail order?

A The Spectrum keyboard is certainly the weak link in this particular Sinclair chain. Perhaps you should consider buying one of the excellent replacement keyboards.

If you want to stick with the original, you will be hard pressed to actually buy one, as it has become Sinclair policy to discourage shops from selling Spectrum components direct to third parties. However, a number of companies can re-

place membranes, one of these being RA Electronics, who can be telephoned on 0502 66289.

Picture quality

Richard Bennett of Tarporley, Cheshire, writes:

Q I have noticed a couple of adverts recently for units which enable the Spectrum's sound to be fed to the TV speaker. As they are about the same price as amplifiers I was wondering whether they are as effective and whether they affect picture quality?

A By and large these units are not as effective, on their own, as an amplifier. They usually use the TV amplification system and merely feed the computer sound signals through that. As they utilise the normal TV sound system they will have no effect on picture quality.

Spectrum queries

David Cowler of Hemel Hempstead, Herts writes:

Q After having just finished reading PCW, I felt that for the first time ever in my two years computing, I must write to a computer magazine. I have a number of queries which compelled me to write to you about my Spectrum.

1. How do you disable Break?
2. How do you disable List?
3. How do you disable Save?
4. Is there any way of testing to see if the Break key is being pressed?
5. What is the best available book (or cassette) which thoroughly explains Spectrum machine code?

A Phew....

OK here we go.

1) Break is normally disabled by setting the Err Sp system variable to zero. This causes the machine to New if Break is pressed during the running of your program.

2. My favourite method of disabling List is to scramble the keyword tokens in the character set. That is, change the Save

keyword to Load, change Let to List, etc. This produces such a mucked up listing as to make it unusable.

3. Basically, if someone has broken in to your program then disabling Save is not really going to achieve very much. By far the best method of achieving program protection is to disable the keyboard scanning routine, and do all reading of keys yourself.

4. The ROM routine at 1F54 tests for the Break (and also for Shift and Break). It is a very small routine and can be used from within one of your own programs.

5. Z80 Language Programming by Lance Leventhal is one of the most comprehensive works on the subject.

Which system?

K D Outteridge of Didcot, Oxfordshire writes:

Q My problem is probably not a common one, but I should be very grateful if you could help me. Having been using main-frame computers for scientific computing for 20 years of so, and having recently retired, I should like to buy a home computer to continue some of the projects (using Fortran translating to Basic) which were never finished at work.

The problem is that I have costed my requirements — word processing, disc drive (single or double), at least 64K Ram, preferably a 16-bit processor, cassette recording capability (compatible with T199/4A), good graphics and colour — for several different systems, including the BBC and the total always seems to amount to around £1300.

I have an aversion to the Commodore 64 which would be less at £800 or so. It eventually penetrated my skull that a small business computer might suit me, and

the two models I came up with are: Sanyo model MBC 555 — £1148 with 128K and twin disc-drive and the Sanyo model 550 — £862 with 128K and single disc drive. What do you think?

A Well...you obviously know what you want — now all you have to do is find it.

Of the two Sanyo machines you mention — which seem quite sensible — my preference would be for the MBC 555. The double disc drive gives you the ability to copy disc to disc (for security) and also increases the amount of on-line data storage at your command for work processing.

It is extremely unlikely that you will be able to achieve TI 994/A cassette compatibility, no matter what system you buy. So, unless you could write a machine-code program to read and list the contents of a TI cassette, or borrow one, I am afraid you have had it.

One last thought, as you are converting Fortran programs, why convert them to Basic? If the Sanyo computers have a Pascal compiler available you might find that that conversion was less tiresome, and that the programs ran a lot faster than with Basic.

Modem plug-in

Wendy Best of Nottingham, writes:

Q I own a Vic20 and I would like to buy an inexpensive telecommunication modem to plug in the back. Could you tell me how much they cost and where I could get one from?

A The Maplin modem at about £40 is probably the cheapest way into the communications area. Maplin also provide an interface to allow this modem to be connected to the Vic20 (via RS232C). You can contact Maplin on 0702-552941.

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ZX SPECTRUM 48K, £100 of s/w + printer + paper + recorder, £210 ono. Tel: 01 478 4256.

SPECTRUM programs Tasword II £7, Psytiron, Mugsy, Codename Mal £3, JSW, Andromed 2 Scuba Dive and others £2 each. Paul on 01-997 3262 (Ealing).

ORIGINAL (rubber key) Spectrum keyboard for sale £10. Ideal if some of your keys won't work. Write to 5 Essex Close, High Crompton, Shaw, Oldham, Lancs. OL2 7EA.

SPECTRUM software Cyrus Chess £5.00 Psytiron £4.50 all other games £3.50 (48K) £3.00 (16K). Write to 42 Lodge Farm Lane, Arnold, Notts NG5 8HR.

48K SPECTRUM + accessories, joystick, s/w books all boxed. Worth over £500 sell £300 ono. Tel: cambridge (0223) 860626.

48K SINCLAIR Spectrum + ZX Microdrive, Masterfile I, DK Tronics keyboard, ZX Interface 2 + joystick Currah Microspeech + Fuller Nator speech synthesiser. £100 of s/w inc. Quill, 7 books. Cost over £550. Sell £300. Tel: 01-593 0675.

ORIGINAL SPECTRUM software worth £170, Currah Microspeech and ZX printer. Bargain at £130 ono. contact Doug Duffin 5/71 Donnelly, University of Stirling, Stirling, Scotland.

SPECTRUM OWNERS — a Storch programmable interface for any Atari style joystick excellent condition a bargain at £15 ono. Telephone Preston (0772) 717607 after 5pm any weekday.

65

built screen, plus two games, and light pen + software. Cost £165, sell for £90 ono. Phone 01-540 9368 after 6pm (London SW20).

Wanted

WANTED PROGRAMMABLE INTERFACE with or without joystick also keyboard for Spectrum. Must be cheap. Ring 0742 613878.

WANTED VIDEO Geni interface. W. Irving. Tel: 0380 812596.

SWAP ORIC 1 48K + £80 of s/w + books and games for 48K Spectrum. Tel: 0734 595411 ext 265 Mr Geater. **WANTED FULLER** soundbox demo tape, also wanted any Spectrum magazines. Tel: 068641 376 after 5pm.

WANTED SINCLAIR microlines (interface not required). Must be in good condition. Also consider any micro drive cartridges full or not. Tel: 01-683 1039. Offers after 6pm.

I WOULD LIKE some one to be my penpal. All letters answered. Write soon. Colin Edwards, 33 Ardore Road, London SW2 2BQ. England.

WANTER PRINTER for Dragon 64. Centronics or RS232. Will swap best offered for Omnicord Synthesiser. Full Rhythm section, auto cording. New in box with P.S.U. cost £175 (unwanted present). (0243) 826012.

WANTED 32K Ram for 16K Spectrum. Will pay reasonable price. Must be working order. Calne 815491. Ring Calne (0249) 815491 evenings.

WANTED NON-WORKING Dragon, Spectrum, Vic20 or Pet in any condition. Phone 036287 327.

SWAP DRAGON 32 E110 s/w for 48K Spectrum (no software needed) or sell for £90. Contact Anthony at Stratton (0761) 232258 evenings.

WANTED SPECTRUM 48k in working condition £50 or Spectrum 48k and microdrive £90. Willing to negotiate. Phone 0708 854745 (Paul).

WANTED COMMUNICATION software to run modem from Dragon 32 Maplin serial interface or from Dragon 64. Please phone 01-821 1710 after 7pm.

WANTED EX. BASIC for T199-4A also any other hardware or software. Details please to Ken Llangefni 724636 N. Wales.

SPECTRUM 48K wanted will swap my AK1A HX-3 stereo cassette deck new (unwanted gift). Cost £100 phone Fredy 0346 24994/24206.

FOR SALE OR SWAP 2 books, Programming your ZX Spectrum and Games ZX Computers Play. £7.00 ono. Please ring 0282 68646 and ask for Philip.

WANTED S.P.I. and A.H. Wargames. Write to 8 Oriol Close, Sudbury, Suffolk CO10 0DF.

WANTED ANY ZX81 software or hardware. Will exchange for Spectrum Hunter Killer and Ship Of Line or will buy. Tel: 0279 445204.

SWAP TRIO (27 watts per channel) stereo amplifier + matching tuner for CBM 64 peripheral. Office tel: 01-934 3167. R.G. Forster.

WANTED ORIC 1 5.25in. Disc drive and D.O.S. or any help to achieve it. Phone Blackpool (0253) 49493 Kevan evenings.

WANTED TO BUY software for BBC Dragon or Spectrum. Phone 09285 60635 Sundays only.

SWAP MY QUICKSHOT 11 for Kempston 5000 or Suncom Tac 2. Write to Stephen at 35 Elstead Road, West Vale, Kirkby, Liverpool L32 4TE.

WANTED M280K exp. 60x M28010 for sale — cord coupler £75. Ring John — on 021-551-6427.

ADVENTURE HELPLINE

The Hobbit on Spectrum. Once through the wine cellar, how do you find lake town and 'bard'? where is the key for the mountain-side door? John Osbourne, 28 Edwin Avenue, Woodbridge, Suffolk.

Voodoo Castle on BBC. How do you get the ju-ju bag? Jason Wright, 99 Carter Drive, Collier Row, Romford, Essex.

Adventureland on Vic20. I am stuck at the royal chamber. When you say Help it says 'Blow it up'. Blow what up??? Matthew Pooler, 18 Johnstone Close, Wrockwade Wood, Telford, Shropshire.

Countdown to Doom on BBC. How do I get past the robot in the screen of light? John Beman, 5 Church Lane, Elvington, N Yorks.

Ship of Doom on Spectrum. I cannot get the key from the glass cover or release the body from the ice. Any clues please? Jay Pannett, 3 Forest View, Hailsham, Sussex.

Espionage Island and Golden Apple on Spectrum. I cannot get past the tank in the first and the crocodile in the second. Andrew Cameron, 51 Backwoods Lane, Lindfield, W Sussex.

Tombs of Xeiops on Commodore 64. How do I get past the keeper of

the tombs—I have been everywhere else and my score is only 57 out of 100? Is the pyramid of any use? S P Lotterill, 38 Barnet Road, Stockland Green, Erdington, Birmingham.

Circus on Atari. How do I get shot from the cannon without getting killed? Craig Hornby, 12 Pen-yngent Avenue, Burnthdare, York.

Inca Curse On Spectrum. How do I get past the sand dungeon? R Foster, 67 Bushfield Road, Wath-on-Dearne, Rotherham, S Yorks.

Hobbit on Spectrum. How do I get the goblin's ring and how do I get across the fast black river? Scott Fountain, 6 Abinger Road, Pottersdown, Bournemouth.

Zork I on Commodore 64. How do I get the coffin out of the temple? How do I move the platinum bar? How do I use the cage in the shaft? Brendan Bradley, 54 Ashwood Road, Clondalkin, Co Dublin, Ireland.

Hobbit on Commodore 64. I cannot take the treasure. Richard Howlett, 9 Avondale road, South Benfleet, Essex.

Hobbit on Spectrum. How do you get away from the Elf clearing into the elf kingdom? Nicholas Metcalfe, 34 Crossmead, Eltham, London SE8.

Pyramid of Doom on T199/4A. I cannot get into the pyramid. Can you help? Paul Jeffrey, 31 Pine-trees, Weston Favell, Northampton.

Colditz Adventure on BBC. Having escaped from the castle I cannot find the map to show the way to freedom. David Quinn, 35 Longhill Avenue, Ayr, Ayrshire, Scotland.

Hobbit on Commodore 64. I am trapped in the goblins dungeon. I have found the key and I have the sword, the rope, the golden key, the map and the curious key. Chris Barnes, 19 Scafell Way, Clifton, Nottingham.

Hobbit on Spectrum. How do I escape from the goblins dungeon? How do I escape down the river from the elevenkings halls? James Haslam, 6 Sittingbourne Avenue, Bush Hill Park, Enfield, Mddx.

Valhalla on Spectrum. I cannot find Ofnir and I have had the program for three months now. Help! Paul Waggett, 9 Lexton Drive, Churchtown, Southport, Merseyside.

Curse of the Werewolf on Vic20. How do you get into the castle that is guarded by the zombie. Guy Cliffe-Jones, 25 Somerset Road, Edgebaston, Birmingham.

Hobbit on Commodore 64. Terrible to admit but I cannot get beyond 75% of the adventure. Help please. D A Sidey, 11 Romley Close, Basingstoke, Hants.

Franklin's Tomb on Dragon. I am stuck with the cave system which I cannot get out of. Charles Beighton, 25 Penland Road, Haywards Heath, West Sussex.

Diary

Event	Dates	Venue	Admission	Organisers
Electron and BBC Micro User Show	Oct 25-27 10.00am-5.00pm Oct 28 10.00am-4.00pm	Alexandra Palace London N22	£3.00 adults £2.00 children	Database Publications 061-456 6383
Home Tech 84	Oct 26-29 10.00am-6.00pm	Bristol Exhibition Centre	£1.50 adults £1.00 children	Nationwide Exhibitions 0272 680465
Computers in Action	Oct 30 10.00am-6.00pm Oct 31 10.00am-8.00pm Nov 1 10.00am-6.00pm	Anderson Centre Glasgow	Free	Trade Exhibitions 041-204 0280
Mycomp(Thames Valley Personal Computer Exhibition)	Nov 1-3 10.00am-6.00pm Nov 4 11.00am-5.00pm	Fulcrum Centre Slough	£2.00 adults £1.00 children	Swan House Special Events 09322 43866
Home Computer Show	Nov 7 2.00pm-9.00pm Nov 8-10 12.00pm-9.00pm Nov 11 12.00pm-6.00pm	Royal Dublin Society (Main Hall) Ballsbridge Dublin 4	£2.00 adults £1.00 children	SDI Exhibitions Dublin 904171
Buxton Home Computer Fair	Nov 10 10.00am-5.00pm	Paxton Suite Pavilion Gardens Buxton	£1.00 adults 50p children	Technical Promotions 0298 6174
Home Computer Exhibition	Nov 10 10.00am-6.00pm	David Davies Gallery Newtown Powys Wales	20p	Newtown and District Computer Club 0686 28715
Microelectronics Applications	Nov 10 10.00am-4.00pm	Barden High School Burnley Lancs		Barden High School 0282 36324
London Micro Market	Nov 10 10.00am-6.00pm Nov 11 10.00am-4.00pm	Wembley Exhibition Centre	£1.50 adults 75p children	ECC Publications 01-399 3525
6809 Colour Show for Dragon and Tandy Users	Nov 17-18 10.00am-6.00pm	Royal Horticultural Halls London SW1	£2.00 adults £1.00 children	Computer Marketplace 01-930 1612
Computer Auction	Nov 28 6.00pm	Bonington Hotel Southampton Row London WC3	Free	Crocker Computer Auctions 01-387 8838

Vic 20

- (2) Duck Shoot
 - (1) Computer War
 - (3) Punchy
 - (4) Flight 015
 - (5) Max
 - (6) Mass Gold
 - (7) Tank Commander
 - (8) Tower of Evil
 - (9) Jet Pac
- (Figures compiled by Boots/Websters)

- Mustertronic
Creative Sparks
Creative Sparks
Creative Sparks
Creative Sparks
Creative Sparks
Creative Sparks
Creative Sparks
Creative Sparks
Creative Sparks

Commodore 64

- (1) Jet Set Willy
 - (2) Commodore 64
 - (3) Zaxxon
 - (4) Storm Warrior
 - (5) D. Thompson's Decathlon
 - (6) World Cup
 - (7) Scrabble
 - (8) Zaxxon
 - (9) Chess
 - (10) Beach Head
- (Figures compiled by Boots/Websters)

- Software Projects
AAF Software
Melbourne House
E-Tel
Ocean
Aric
Leisure Genius
Centwest
Mastertronic
Centwest

ZX81

- (1) Crazy Kong
 - (2) Walk the Plank
 - (3) Black Crystal
 - (4) Epsilon Island
 - (5) ZAXN
 - (6) Chess II
 - (7) Vu-Sie
- (5 titles tied for 8th position)
(Figures compiled by Boots/Websters)

- PSI
Novus
PSI
Novus
Sinclair
Bay Byte
Sinclair
Aric
Sinclair

Spectrum

- (1) Daley Thompson's Decathlon
 - (2) Toled Low Level
 - (3) Beachhead
 - (4) Matchpoint
 - (5) Kokotoni Will
 - (6) Full Throttle
 - (7) Avalon
 - (8) American Football
 - (9) Sherlock Holmes
 - (10) Lords of Midnight
- (Figures compiled by W.H. Smith)

- (Ocean)
(Vortex)
(USGold)
(Pison)
(Elite)
(Microomega)
(Hewson)
(Argus Press)
(Melbourne House)
(Beyond)

Dragon 32

- (1) Hunchback
 - (2) Mystery of the Jura Star
 - (3) Hungry Horace
 - (4) Mr. Dig
 - (5) Outburst in Space
 - (6) Kriegerplatz
 - (7) Chuckle Egg
 - (8) Dragon Chess
 - (9) Ring of Darkness
 - (10) Equestrian
- (Figures compiled by Boots/Websters)

- Ocean
Shards
Melbourne House
Microdeal
Microdeal
Beyond
A&F
Oasis Software
Winterbach
Microdeal

Atari

- (1) Solo Flight
 - (2) Captain Stickys Gold
 - (3) Computer War
 - (4) Zaxxon
 - (5) Caravel Massacre
 - (6) Caravel of Dada
 - (7) Gridrunner
 - (8) Attack on Muzak
 - (9) Atlantis II
 - (10) Logos
- (Figures compiled by Boots/Websters)

- Centwest
English Soft
Centwest
Atari
Atari
Atari
Atari
Atari
Atari
Atari

BBC B

- (1) Elite
 - (2) Frak
 - (3) Micro Olympics
 - (4) Fortress
 - (5) Wallaby
 - (6) Aviator
 - (7) Smash n' Grab
 - (8) Mr. Wiz
 - (9) Broccoli
 - (10) Dune Rider
- (Figures compiled by W.H. Smith)

- (Acornsoft)
(Aardvark)
(Database)
(Pace)
(Superior)
(Acornsoft)
(Superior)
(Superior)
(Micropower)
(Micropower)

Books

- (1) CEM 64 Programmers Reference Guide
 - (2) Very Basic, Basic for the Spectrum
 - (3) 60 Programs for the Commodore 64
 - (4) Teach yourself Computer Programming on the CEM 64
 - (5) 60 Programs for the Spectrum
 - (6) Step by Step Programming on the Spectrum
 - (7) Practical Spectrum Machine Code
 - (8) Sinclair User Book of Programs and Games
 - (9) Discover your Spectrum
 - (10) Step by Step Programming on the BBC: Book 1
- (Figures compiled by Boots/Websters)

- Pitman
Century
Pan
Hodder
Pan
D. Kindersley
Virgin
Penguin
Century
D. Kindersley

SCREEN MAPS

On first impressions, the *Spectrum Advanced User Guide* is clearly set out and comprehensible, with decent type and a goodly weight. Luckily, reading confirms these impressions.

The first third of the book is a Basic reference section, listing every command alphabetically, each with its own page. Next comes a very good memory map and a screen map... things which are usually inadequate or unobtainable.

There is extensive information about machine code, which also includes a short introduction to this field.

Many Rom routines are listed, not only for the 'stand alone' Spectrum, but also for the microdrives, RS232 interface, network port and ZX printer, allowing all the peripherals to be successfully accessed via m/c. The book manages to include so much because it really is aimed at the advanced.

The only useful thing I can think of that has not been included is the Spectrum character set.

Overall, the book comes out with flying colours.

Book The Spectrum
Advanced User Guide

Authors Adrian Dickens, Mark Plumley, Lylecester Whewell
Supplier Adder Publishing,
PO Box 148,
Cambridge, CB1 2EQ.

ABSTRACT

Purchasers of expensive business systems expect full support in choosing programs: this book provides similar advice for small-business people who use the BBC B.

It covers a range of applications, from accounts to word processors (even a bar code reader), and touches on hardware expansion, including the Torch Disk Pack.

Each topic is discussed in the abstract, indicating what questions to ask about any program type, before specific examples are candidly reviewed, with illustrations.

It is realistic about the expectations and limitations of the machine and should prove invaluable for the newcomer who has just purchased, or is considering, a BBC micro.

Book Business Applications
on the BBC Micro
Price £7.95
Micro BBC
Supplier Granada Publishing, 8
Grafton St.,
London W1X 3LA

This Week

Program	Type	Micro	Price	Supplier
Rally Driver	Arc	Aquarius	£4.95	Micro Mart
Scramble	Arc	Aquarius	£4.95	Micro Mart
The Magic Sword	Ad	BBC	£8.95	Database
Datagem	Ut	BBC	£129.95	BBC
Erik the Viking	Ad	Commodore 64	£9.95	Mozaic
Sherlock	Ad	Commodore 64	£8.95	Melbourne House
The Nomad of Time	Ad	Commodore 64	£9.95	Mozaic
The Pettigrew				
Chronicles	Ad	Commodore 64	£9.95	Shards
BMX	Arc	Commodore 64	£7.99	Jetsoft
California Gold Rush	Arc	Commodore 64	£2.99	Spectrum
Cavelon II	Arc	Commodore 64	£7.99	Jetsoft
Henry's House	Arc	Commodore 64	£8.95	English
Quari	Arc	Commodore 64	£7.99	Jetsoft
Super Utility	Ut	Commodore 64	£10.95	Gala Soft
Spread Sheet				
Calculator	Ut	Commodore 64	£14.99	Kuma
Soldier of Fortune	Arc	Commodore 64	£7.95	English
Strike Force	Arc	Commodore 64	£6.99	Bubble Bus
Tazz	Arc	Commodore 64	£6.99	Bubble Bus
Witchswitch	Arc	Commodore 64	£7.95	English
CHRS	Ut	Commodore 64	£4.95	Miro Mart
Gala File	Ut	Commodore 64	£7.95	Gala Soft
Blockbuster Quiz	Ut	Dragon	£5.50	Computerwise
Darts	S	Dragon	£5.50	Computerwise
Linkword	Ut	Dragon	£5.50	Computerware
Galilee	Ad	Spectrum	£5.95	Shards
The Pettigrew				

Chronicles	Ad	Spectrum	£9.95	Shards
Flip Flap	Arc	Spectrum	£2.99	Software Projects
Freds Fan Factory	Arc	Spectrum	£2.99	Software Projects
Freex	Arc	Spectrum	£2.99	Software Projects
Loony Lander	Arc	Spectrum	£2.99	Software Projects
Moonlighter	Arc	Spectrum	£2.99	Software Projects
Shuttle Shock	Arc	Spectrum	£2.99	Software Projects
Travels with				
Trashman	Arc	Spectrum	£5.95	New Generation
Ziggurat	Arc	Spectrum	£2.99	Spectrum
Jack in Magicland	Ed	Spectrum	£6.95	Turtle Software
Sub Hunter	S	Spectrum	£6.95	Micro Mart
Friendly Face 2	Ut	Spectrum	£6.95	Monitor
Micro Draw	Ut	Spectrum	£4.95	Micro Mart

Key: Ad — adventure/Arc — arcade/Ed — education/
S — strategy-simulation/Ut — utility

This Week is a new section that covers all the new software coming on to the home micro market each week. All suppliers should send details of their new programs to: This Week, *Popular Computing Weekly*, 12-13 Little Newport Street, London WC2R 3LD.

PICTURE SHOW

Projector 1 is a clever idea from McGraw Hill, designed for schools and businesses who want to display a series of graphics, graphs and other information.

The program contains not only graph drawing routines of various sorts, but also a choice of font styles. Having created a number of screens they can be presented in any order, with the delay between screens selected in advance or operated manually.

You can use the program very much like a slide projector, moving back and forth from picture to picture, returning to any particular one as often as you wish.

Program *Projector 1*
Price £9.95
Micro Spectrum
Supplier McGraw Hill
Shoppentangers Road
Maidenhead
Berkshire SL6 2QL

WITTY

Mozaic should probably be credited with starting the idea of bookware, where linked books and software are packaged together, although, its first efforts were pretty disappointing. With *The Stainless Steel Rat* saves the World, things are looking up.

This time you get a pretty sophisticated machine code, graphically illustrated adventure in which you play James di Griz, the stainless steel rat. The



strength of the book (for me anyway) is in the sharpness and wit of the writing; thankfully, the adventure too does not take itself too seriously.

There is a vocabulary of 200 words and the graphics are pretty good, although language analysis is simple verb, noun. Since much of the plot involves travelling through time, the first problem is to find the time helix and work out how to manipulate its four properties of spin, flux, resonance and phase — needless to say, I didn't get anywhere at all.

The worst that could be said of the program is that it lacks anything really new — the best that it captures the flavour of the book well and should keep Tony Bridge in letters for a good few months.

Program *The Stainless Steel Rat Saves The World*
Price £9.95
Micro Commodore
Supplier Mozaic
187 Upper Street
London N1 1RQ

DRAUGHTS



Superior Software has been fairly successful at producing BBC games — the company has now introduced a range of Commodore 64 material including, strangely perhaps, given the number of similar packages, *Chess* and *Draughts*.

Chess is one of those things that computers can do so superbly well (theoretically) that they cannot fail to win. Still, any sensible program is going to make sure you can avoid this inevitable alternative.

Pick of the week

POT-POURRI

I always wonder about multi-player games on computers. For some social or ergonomic reaction, computers seem best suited for solo activities and I wonder whether multi-player games ever do well — has anyone ever seen one in any of the charts?

The above, of course, has nothing to do with any inherent failure on the part of the games. *The Prince* would seem to be excellent — in any event it won a prize.

The Prince is for four players and is a veritable pot-pourri of Machiavellian machinations between player and player, and player and machine. The objective is to become master of the Lore — chief bureaucrat to the Prince and all round power wielder. This is accomplished by discovering and presenting the appropriate tokens of succession.

The four players represent a landowner, a cleric, and merchant and a tipstaff, and are respectively named Grasper, Ambrose, Porcus and Fernado (some evidence of political bias revealed here, I think Margaret). Each role has inherent advantages, eg, Porcus dispenses money.

The actual game consists of each player taking turns buying and selling, using spies, vio-



lence and bribery to discover the whereabouts of each token. The castle can be searched as in a conventional adventure, moving around and using words like Look, Examine and Take to see what's there.

It's devious and enormous fun — I hope that there are enough computer owners with three friends out there to do it justice. Oh yeah, it has nice graphics too.

Program *The Prince*
Price £7.95
Micro Spectrum
Supplier Cases Computer Simulations
14 Langton Way
London SE3 7TL

Draughts allows you a variety of different options — next worse move, take back, play best move, etc, and will play at a variety of levels and speeds. One useful option for those who find the level of speed they have set is too slow is a 'play immediately' command which forces the computer to move.

If you want draughts for your Commodore 64 this one would seem to have all the features you could need.

Program *Draughts*
Price £7.95
Micro Commodore
Supplier Superior Software
Regent House
Skinner Lane
Leeds
LS7 1AX

CHEAP

Now this is a very good idea — a range of Quilled adventures for a mere £1.75; not only that, but the various titles are coded so that you can get an idea of the degree of difficulty of each adventure before you start. Each adventure is divided into two sections; side one outlines the story and gives you some hints, side two is the game itself.

Faerie is described as of advanced level and is the only one of the first crop of six adventures to follow the traditional dungeons, dragons and elvish path. Nevertheless, it has much to recommend it. For one thing it manages to be both

surreal in plot but logical in terms of conundrum solving at the same time.

There is a sort of dreamish air about *Faerie*, with an aura of innocence about it too. Snowmen, caves, granite chess pieces and magic circles all feature in the game and it is excellent. Nor are these Eighth Day adventures one day wonders; the cheat sheet on *Faerie* extends to three pages and I'm not going to give you a single clue.

Program *Faerie*
Price £1.75
Micro Spectrum
Supplier Eighth Day Software
 18 Flaxhill
 Moreton
 Wirral
 Merseyside L46 7UH

CAVEMAN

Fire Quest is another one of those games which describes itself as more than an arcade game having adventure overtones. What it is is a multi-screen arcade game which has overtones of *Horace and the Spiders* and, more particularly, *Ugh!*

Ugh! was an excellent arcade game involving a cave-



man collecting eggs; *Fire Quest* continues the caveman's adventures in search of fire over seven different adventures. All involve dodging things, mostly spiders and fireballs, climbing things (ladders) and swinging across vast gulfs.

It's all about fast reactions so is definitely for arcade, rather than adventure, fans — still, at least it doesn't include aliens. If

you get past the final screen, there's a prize; what greater motivation do you need?

Program *Fire Quest*
Price £9.95
Micro Commodore 64
Supplier The Edge
 31 Maiden Lane
 Covent Garden
 London WC2

VIKING SAGA

The Saga of Erik the Viking is the latest of Mozaic's bookware packages — the original book by Terry Jones now has an adventure game based on it written for Mozaic by Level 9. Level 9 have produced a fairly compulsive graphic adventure with versions for the Spectrum, BBC and Commodore 64.

Obviously the various versions will have slightly different characteristics — the Commodore 64 edition took ages to draw its pictures, but that may not be true of the Spectrum version.

The graphics are pretty good, and more importantly perhaps, they have a sort of style — the Viking farm not only looks pretty but also looks vaguely like how you'd think such a farm would look.

As it is by Level 9 the adventure itself is pretty devious; although it sticks to basic verb noun entry, there is much to explore and within the first few screens. Enough conundrums are introduced to keep it all interesting. I was really chuffed that I managed to solve one of them which is to do with some footprints...

Program *The Saga of Erik the Viking*
Price £9.95
Micro Commodore 64
Supplier Mozaic
 John Wiley & Sons
 Baffins Lane, Chichester
 Sussex PO19 1UD

SEQUEL

Pitfall has a sequel and it's called *Pitfall II*. Pitfall Harry, hero and adventurer, returns again to do battle and swim, jump, climb and run his way through the usual sprites.

The object of the game is to move Harry around various screens looking for his niece, the Raj diamond and a treacherous cat called Quickclaw; as a



bonus there are 28 bars of gold to collect.

There are a large number of different screens with ropes to swing on, pits to avoid, rivers to swim with nasty fish and platforms to run along. If you liked the first one, you're sure to like this.

Program *Pitfall II*
Price £9.99
Micro Commodore 64
Supplier Activision
 CGL House
 Goldings Hill
 Loughton
 Essex

CUTHBERT

Cuthbert rears his bespectacled head yet again in *Cuthbert enters the Tombs of Doom* — for the Commodore 64. This one falls into the category of 'complicated arcade game' as you try to find your way (well, Cuthbert does) around over 200 rooms in which lurk nasty things, clues, chests to be opened and so on.

Cuthbert is equipped only with the Ray of Ra which lets him zap at the more feeble ghosts but mostly its better to keep him out of their way (I know how they feel). You can guess that with a couple of hundred locations there's going to be a sense of déjà vu about them, but even so there is a variety.

The packaging is particularly nice — you get a neat little manual that gives you a few hints on how to master the first few sections and even has a map of the first 40 rooms. There is, inevitably perhaps, a prize at the end. One of the best Microdeal games in a while and reasonably priced too.

Program *Cuthbert enters the Tombs of Doom*
Price £6.95
Micro Commodore 64
Supplier Microdeal
 41 Truro Road, St Austell
 Cornwall PL28 8JE

UNORIGINAL

Rocket Roger is the sort of game title that makes my heart sink — you just know that the game concept will be boring and unoriginal, the programming technically professional but lacking real inspiration and the damn thing will sell by the sackful.

Anyway, *Rocket Roger* has to walk run, jump and (it says here) thrust his way around the many caverns of an unknown planet. The idea is to collect vital power crystals and fight off the usual baddies.

It is, of course, *Manic Miner* again except that there's far less wit and far less inspiration — if you want your 127th version of MM then this is the program for you.



Program *Rocket Roger*
Price £7.95
Micro Commodore 64
Supplier Alligata
 1 Orange Street
 Sheffield
 S1 4DW

Compiled by Graham Taylor

New Releases is designed to let people know what software is coming on the market. If you have a new game or utility which you are about to release send a copy and accompanying details to: New Releases, Popular Computing Weekly, 12-13 Little Newport Street, London WC2R 3LD.



Chance confusion

Probably probability is one of the most confusing, and confused, topics around. Take poor Prince Harry, nappies and all; so much depended upon him, because "If the Princess of Wales' second child is a girl, she'll complete a pattern of births which beats almost astronomical odds — about one in 65,000 to be precise" (*Parents* magazine, October 1984).

Of course what *Parents* forgot to tell you is that, if the second baby was a boy, then the odds on that pattern of births was also about one in 65536.

The odds on any pattern of 16 births is 2^{16} , be the child male or female. The actual probability that any child is male (or female), regardless of any previous pattern or history is approximately one in two.

Given the past history of royal birth presented in the article, the odds on the second child being a boy were 11 to eight — the second child was more likely to be a boy.

The second child was more likely to be a boy if the present birth was related to previous royal births (royal genes?). And, if not, boy or girl is equally likely.

Examples abound of similar confusions in probability, where the confusion is between what happens by chance, and the sense we make from a sequence. Any sequence of 16 births is as likely as any other, though it may be interesting that first-born were all boys, and the second born were all girls (until Harry).

Take a rather less regal example. In a magazine there are eight reviews, for example, and two of the reviews are by the same person, call him/her X (the other six reviews are by six other people). There are 28 different combinations of two reviews; to choose any combination 'at random' means that each combination is as likely as any other to be chosen.

Therefore, of course, one is just as likely to choose two reviews by the same person as any other combination of reviews. To assert that a choice is not random because the two reviews are by the same person is a confusion on a par with that from *Parents* magazine. 'Randomness' is a facet of the selection procedure, not of the result of the selection. Incidentally, the probability of choosing X as at least one of the two reviewers is 13 out of 28 (or almost one in two) — that is probably surprising.

If you had to bet on one of the two reviewers being X, good odds would be three to one (you argue that the odds of choosing an X review are two to six), but really the fair odds are 18 to 13. If you had to bet on one person appearing (at whatever odds) one would, of course, choose prolific reviewer X. You are more likely to be wrong than right — but you are *least* likely to be wrong. X is the 'maximum likelihood' estimate, in that if you have to guess, choose X, because it is the most likely single answer.

Generally speaking this is what expert systems in computers perform: an expert system is no more than a set of rules and probabilities, the outcome being the most probable solution, with possibly a series of less likely answers.

As we have seen, in the expert system to predict who has a review within the two chosen at random, the 'most likely' answer is often more likely to be wrong than right. However, of all the possible answers, it is least likely to be wrong.

Often, however, the decision from the expert system is also more likely to be right, rather than wrong. If a decision has to be made between a restricted range of causes of an illness, it is possible that the expert system can be very useful at predicting the appropriate cause. The success of such an expert system is difficult to assess, for an interesting reason.

If I have two points on a graph, I can always draw a straight (two dimensional) line through these two points. With these two points I can draw an infinity of flat (three dimensional) surfaces. If I have three points, I can draw one surface, but possibly no straight line, and the extra point is a check on the line. If I have a large number of observations on fewer people, I can always be totally correct in my predictions.

This is why to assess the utility of an expert system, which by its nature is continually being modified to take into account new forms of information, the testing of the system has to take place over a wide variety and number of independent test cases.

Boris Allan

Letter substitution

Puzzle No 130

Here are two alphanumerics in which digits have to be substituted for the letters.

- (i) $P * (P * C * W) = PCW$
 (ii) $W * (P * C * W) = PCW$



There are no prizes to readers of this magazine for identifying what those letters usually mean — but here we are after the digital value of these expressions. There is one answer to the first alphabetic, but three possibilities for the second. What are they?

Solution to Puzzle No 125

Of the 7776 different throws possible with five dice, 1811 of them will win. Thus the player will have slightly less than one winning throw in every four.

The program takes each throw in sequence and keeps count of winning and losing throws.

```
10 LET T = 0: LET U = 0: FOR A = 1 TO 6: FOR B = 1 TO 6: FOR C = 1 TO 6: FOR D = 1 TO 6: FOR E = 1 TO 6: LET S = A + B + C + D + E: LET P = A * B * C * D * E: LET Z = P/S: IF Z = INT(Z) THEN LET T = T + 1: IF Z <> INT(Z) THEN LET U = U + 1: NEXT E, D, C, B, A: 130 PRINT T: 140 PRINT U: 150 PRINT T + U
```

Winner of Puzzle No 125

The winner is Carol Huffman, Albany Ct. Brunswick Rd, Earsdon, Coventry, (using a QL), who receives £10.

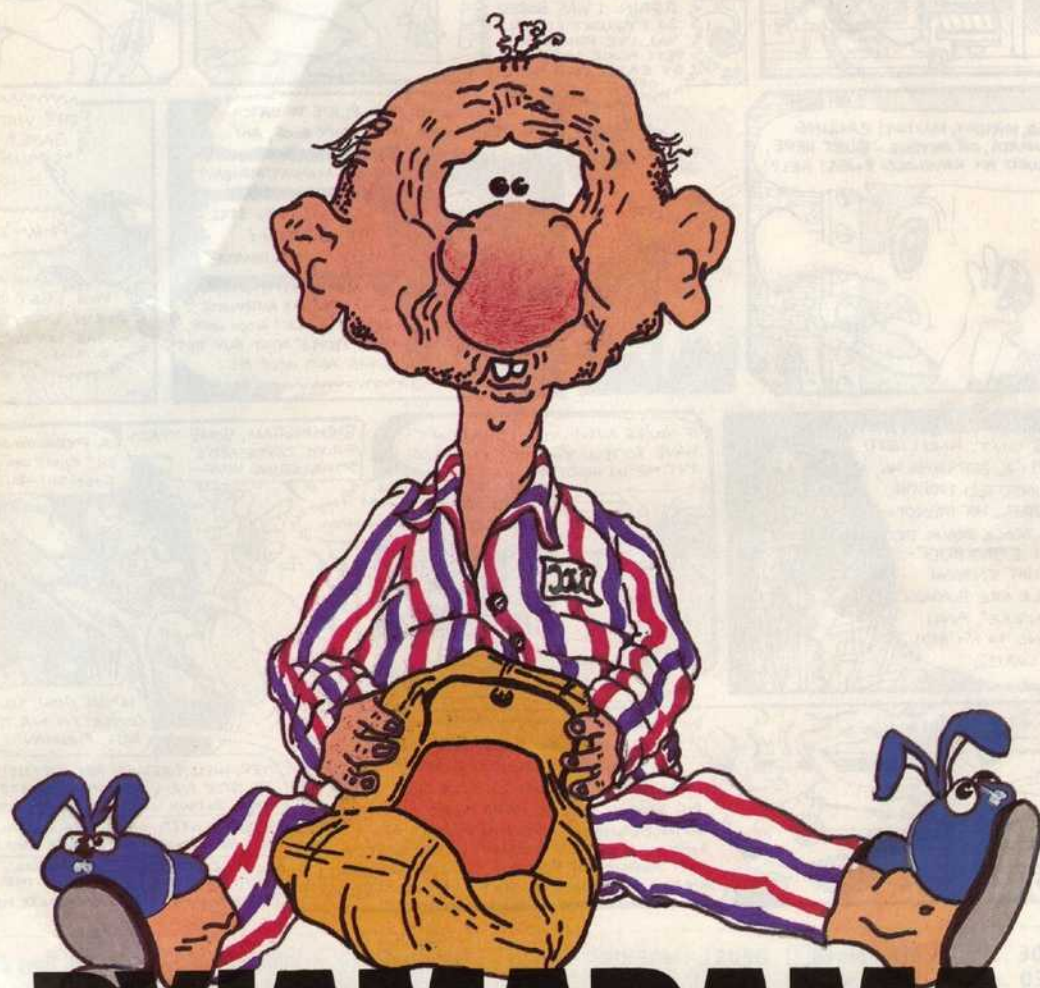
Rules

If the puzzle prize can be sensibly solved using a computer, then the winner will have included a listing of the program used to find the correct answer. The closing date for entries to Puzzle No 130 is November 9.

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THE OFFICES OF AUTOMATA, IN
THE DEAD OF NIGHT



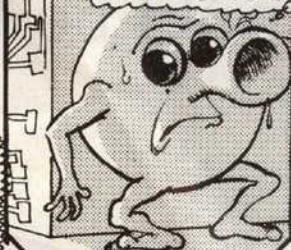
AUTOMATA'S ANSWERING
DEVICE HERE. PLEASE LEAVE
YOUR MESSAGE AFTER
THE TONE. BPPH!



ULLO. 'DEPRESSED'
OF BIRMINGHAM 'ERE
AGAIN. I WAS BORED,
SO I THOUGHT I'D CALL
YOU. I'VE RUINED ME
BEST ALICE COOPER LP
BY EATIN' COLD BEAN'S
OFF IT...

MEANWHILE, INSIDE
"THE COMPUTER"...

THE BUGS ARE AFTER ME -
I NEED MORE HELP... THE
PIMAN HAS DESERTED ME...



MAYBE IF I USE
SOME OF THESE
CIRCUITS, I CAN
GET A MESSAGE
TO AUTOMATA



HELLO, MAYDAY, MAYDAY! CALLING
AUTOMATA, OR ANYONE - BURT HERE,
PURSUED BY RAVENOUS BUGS! HELP!



CAN ANYONE
HEAR?

HELLO!

MAYDAY!



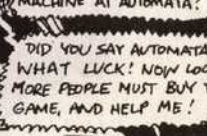
I'M USING ME ONLY PLATE TO CATCH
THE DRIPS FROM THE LEAKY ROOF, AN'...



HELLO! MAYDAY, MAYDAY!

ULLO. IS THIS STILL
THE ANSWERIN'
MACHINE AT AUTOMATA?

DID YOU SAY AUTOMATA?
WHAT LUCK! NOW LOOK,
MORE PEOPLE MUST BUY THIS
GAME, AND HELP ME!



EH? WOT
GAME?

"PI-IN-'ERE"!

HUH, I BET IT'S
BORIN' EVERYTHIN'
IN THE WORLD'S
BORIN'.



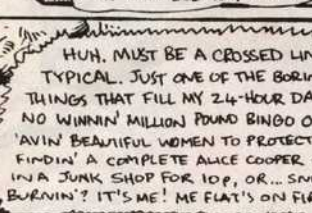
THIS ISN'T! AND I NEED
HELP! I'VE BEEN SHRUNK,
AND INJECTED INTO THE
COMPUTER... MY MISSION
IS TO TRACK DOWN THE
ELUSIVE "BIG BUG" -
BUT NOT ENOUGH
PEOPLE ARE BUYING
"PI-IN-'ERE", AND
COMING TO MY AID!
BUT WAIT...



IF YOU'RE AUTOMATA, I SHOULDN'T
HAVE TO TELL YOU THIS! YOUR LOT
PUT ME IN HERE!



WE CAN SEE YOU, BURT!

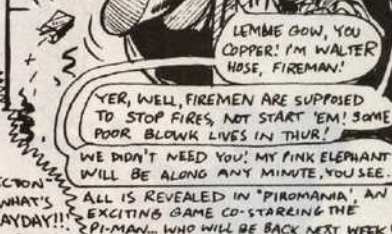


HUH, MUST BE A CROSSED LINE.
TYPICAL. JUST ONE OF THE BORIN'
THINGS THAT FILL MY 24-HOUR DAY.
NO WINNIN' MILLION POUND BINGO OR
'AVIN' BEAUTIFUL WOMEN TO PROTECT OR
FINDIN' A COMPLETE ALICE COOPER COLLECTION
IN A JUNK SHOP FOR 10P, OR... SMEE... WHAT'S
BURNIN'? IT'S ME! ME FLAT'S ON FIRE! MAYDAY!!

BIRMINGHAM, SOME YARDS
FROM 'DEPRESSED'S'
SHOULDERING NOVEL...



A PYROMANAC,
EH? COME ON,
SOONSHINE...



LEMME GOW, YOU
COPPER! I'M WALTER
HOSE, FIREMAN!

YER, WELL, FIREMEN ARE SUPPOSED
TO STOP FIRES, NOT START 'EM! SOME
POOR BLOWK LIVES IN THUR!
WE DIDN'T NEED YOU! MY PINK ELEPHANT
WILL BE ALONG ANY MINUTE, YOU SEE...
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